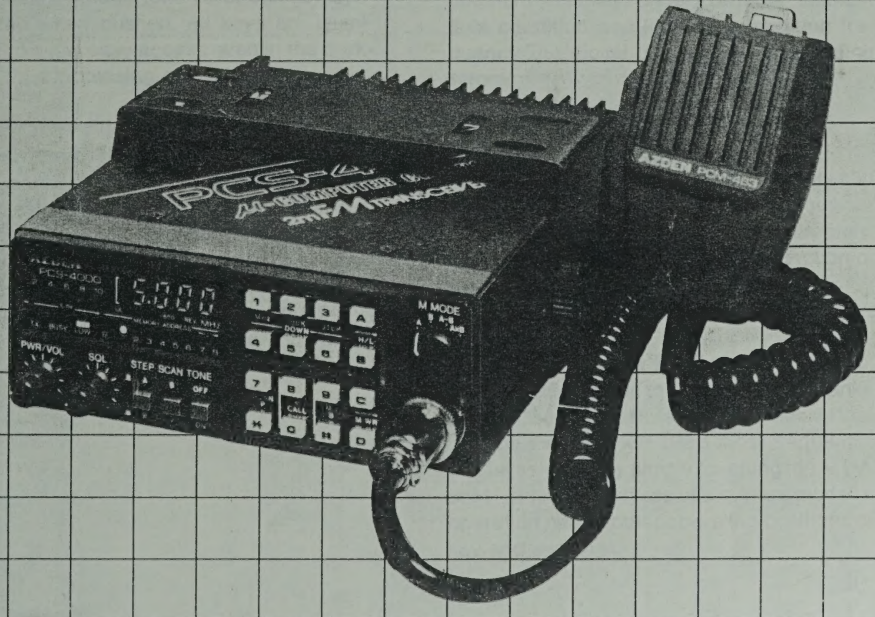
AZDEN®

2m FM TRANSCEIVER

PCS-4000

INSTRUCTION MANUAL



JAPAN PIEZO CO., LTD.

CONTENTS

※This manual was prepared mainly for U.S.A. model.

MAJOR FEATURES

1. C-MOS Microcomputer Control
The built-in microcomputer makes scanning for Busy and Vacant channels possible. Channel operations are all computer-controlled. Once stored in memories, frequencies are retained even when the power is turned off. A long life, rechargeable Ni-Cd battery is used as a memory back-up power supply.

2. Feather touch tuning control key board
All tuning operations are conducted by simply pushing the key(s) which always returns acknowledge tone electronically synthesized when pushed. All keys are illuminated to allow easy access even in the darkness, thus increasing operationability.

3. Two bank, 16 memory channels
Each bank contains 8 memories, so frequencies(channels) up to 16 can be stored, offering advantage for club use. The microcomputer scans each or both banks to find a busy or a vacant channel automatically according to the instructions from the SCAN and M MODE switches. Erasing and rewriting are easily performed.

4. Operating frequency is always displayed
While transmitting, the shifted frequency as determined by the microcomputer is displayed. A microphone having 3 different functions is provided as a standard accessory.
An easy-to-handle palm-control microphone performs the functions of Push-to-Talk, Frequency UP and DOWN and Memory 1A Calling.

5. Green display employed
Frequency display uses 4 digit green LED for optimum visibility under variable ambient light condition and indicates operation frequency. The digital display prevents reading errors.

6. Programmable band scanning
Any two bands arbitrarily selected between the lower and upper limit of the frequency range of this unit can be scanned separately or sequentially by using P SCAN function of the keyboard.

7. One touch priority channel access
Each M1 address on the A & B memory banks allows direct access, so two channels, that may be the channels used most frequently, can be selected by simply touching the M1-A or M1-B key regardless of a current mode of operation or any other operating positions of key and switches.

8. Standard or non-standard frequency shift operations

The microcomputer allows the standard ± 600kHz shift operations with the SHIFT key pushed for duplex operation. Furthermore, the computer also allows non standard any frequency shift operations by utilizing its memory functions and "AxB" mode in accordance with the program installed.

9. Memory address indicator

The memory address indicator consisting of a memory bank indicator LED and 8 address indicator LEDs display the channel(s) being used.

10. Selectable 5 or 10kHz channel spacing

Frequency step of 5 or 10kHz(12.5kHz or 25kHz in European Version) is selected with the STEP switch provided on the front panel.

11. 25W/5W switchable power output

Hi/Low power switch selects either 25W or 5W transmit power output, thus minimizing possible interference or saving power consumption.

12. Optional tone call unit available

A space for mounting the optional tone call unit is provided inside the unit for your additional tone call operation. The TONE switch used for this purpose has been already mounted on the front panel of the unit.

CAUTIONS BEFORE USE

Before connecting the unit to a power supply, check that the antenna is securely mounted on your car. Check the external antenna system for short-circuit using an ohmmeter, and then firmly screw the antenna plug into the antenna connector on the rear panel of the unit.

* Check that the antenna cable used is of 50-ohm impedance. We recommend you to use a RG-58/U or RG-8/U or equivalent coaxial cable for the antenna connection.

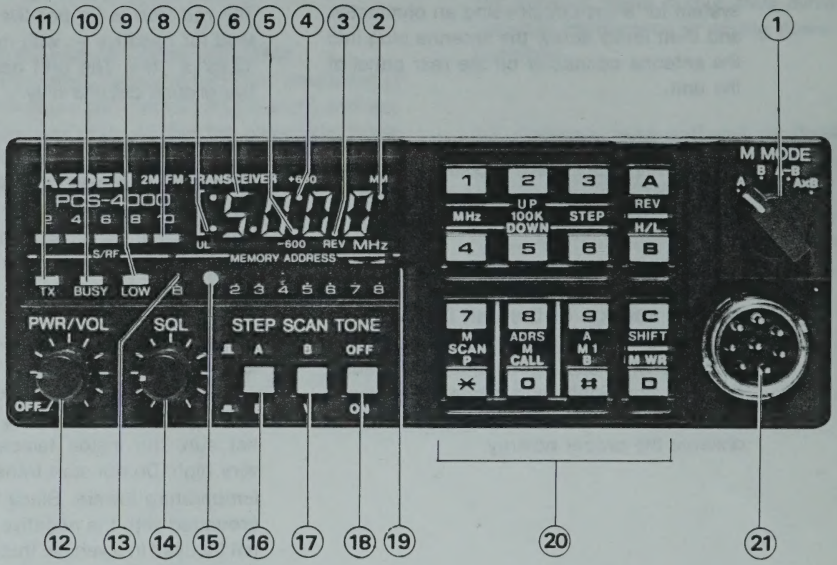
★Rated voltage of the unit is 13.8V
Be careful not to connect the unit to an improper power source, as this may cause damage. For mobile use connect the power cable directly to the battery, being careful to observe the proper polarity.

★Check that power supply voltage is 12 to 14V and each lead wire is connected to correct polarity.
The red lead is for positive + and the black lead for negative −, with maximum rating of 13.8V ± 15%. The unit designed for negative ground circuits only.

★Be sure the unit is properly located
When using this transceiver as a fixed station, it should not be located in a place directly exposed to sunlight or with excessively high humidity.

When using this unit as a mobile station, avoid locating it where it comes in direct contact with the air flow from the vehicle heater. If a vehicle is parked for a long period under the hot sun, the inside temperature becomes very high. Do not start transmitting until the temperature lowers. Since this unit is to be grounded with the negative terminal, it must not be used in a vehicle that is grounded with the positive terminal without taking proper measures for insulation.

CONTROLS AND SWITCHES AND THEIR FUNCTIONS



(1) Memory Mode Switch (M MODE)
There are two memory banks (A & B) inside the unit and these memories can be used in four ways as shown below:

a. With the M MODE switch placed in the "A" position, the "A" memory bank is selected. The "A" memory bank has eight memories and any operating frequencies up to eight will be stored in the memories.
b. When the switch is placed in the "B" position, the "B" memory bank is selected with the "B" bank memory LED(13) turned on. The "B" bank has also eight memories and allows 8 operating frequencies to be stored.
c. With the switch placed in the "A-B" position, both "A" and "B" memory banks are selected sequentially, so stations(frequencies) up to 16 can be scanned automatically or selected if they have been stored previously.
d. With the switch placed in the "AxB" position, the "A" bank memory is selected during receive mode of operation and the "B" bank memory is selected during transmit mode. Accordingly, if you store a frequency on the "A" bank memory and another frequency(offset frequency you want to operate) on the same address memory of the "B" bank, reception is made with the frequency stored in the "A" bank memory and the transmission is made with the frequency stored in the "B" bank memory. Namely, communication will be made with any non-standard frequency offset if the switch is placed in the "AxB" position.

(2) Memory Mode Indicator (MM)
This serves to indicate that the unit is operating under Memory Mode(with SCAN-M/P, M-ADRS/CALL, M1-A/B button pushed). For further details, see the section entitled "Details of Keyboard"

(3) Reverse Mode Indicator (REV)
This serves to indicate that the unit is operating under Reverse Mode with the REV key pushed. For further details, refer to the section entitled "Details of Keyboard".

(4) +600kHz Indicator (+600)
This serves to indicates that the transmit frequency is 600kHz higher than the receive frequency in transmission. With the indicator turned on, the Frequency Display shows a frequency equal to "receive frequency plus 600kHz" when the Push-to-Talk(PTT) switch is depressed.

(5) −600kHz Indicator (−600)
This serves to indicate that the transmit frequency is 600kHz lower than the receive frequency in transmission. With the indicator turned on,the Frequency Display shows a frequency equal to "receive frequency−600kHz" when the PTT switch is depressed.

(6) Frequency Indicator
This indicator displays the lower four digits of transmit or receive frequency on large LEDs. For example, 5.000 stands for 145.000MHz.

(7) Unlock Indicator (UL)
This indicator lights up when the PLL circuit which synthesizes frequencies is not locked. With the indicator lit up, all transmit and receive operations are disabled to prevent illegal frequency generation or causing possible interference to other parties.
The UL indicator may light up for a short time immediately after the power is turned on, or after a channel change, because the PLL circuit requires a brief time period to be locked. So this intermittent lighting operation is normal. However, where will be some troubles if the Indicator remains to light up for an extended period of time.

(8) Signal Indicator (S/RF)
This indicator displays the input signal strength during reception or a relative power output during transmission, using five LEDs. The indicating level will be affected by the SWR of the antenna system used, therefore, 25W output does not necessarily mean that all five LEDs must be illuminated.

(9) Low Power Indicator (LOW)
This indicator, when turned on, indicates that the low transmit power of 5W is selected. On the other hand, the indicator turned off indicates that the high transmit power of 25W is selected.

(10) Busy Indicator (BUSY)
This indicator lights up when a station is received, thus indicating that the channel is in use.

(11) Transmit Indicator (TX)
This indicator lights up when the PTT switch is depressed, thus indicating that your message is being transmitted.

(12) Power On-Off/Volume Control (PWR/VOL)
When the control knob is placed in the OFF (fully counterclockwise) postion, the power is turned off. Rotating the knob clockwise will turn the power on, and further rotation will increase the sound volume from the built-in speaker.

(13) "B" Bank Memory Indicator (B)
This indicator, when turned on, indicates that the memory "B" bank is being selected.

(14) Squelch Control (SQL)
This control is used to eliminate annoying background noise when no signal is present. To adjust the Squelch control properly during reception, first turn the knob counterclockwise until background noise is heard. Then rotate the control slowly clockwise until background noise just disappears. At this point, the receiver will be relatively quiet under no signal condition, but an incoming signal will overcome the squelch action and be heard. Since this control is variable it can be used to

provide varying degrees of sensitivity to incoming signals. As the control is advanced from the extreme counterclockwise position, the squelch action is progressively increased and stronger signals are needed to overcome it. To receive extremely weak signals or to disable the squelch circuit, simply turn the control fully counterclockwise. The squelch control also decides scan stop sensitivity. So stations may be properly skipped by adjusting the squelch control knob during scanning operation.

(15) Memory Address Indicator (1-8)

This unit has two memory banks, each of which has eight memories. The memory address indicator shows which address of the memory (channel or station frequency) is being used in the memory mode of operation. For selection of the memory banks, refer to "Memory Mode Switch".

For example, when the memory address "1" on the memory "A" bank is called up by M1-A key, the address indicator "1" lights up in addition to the memory address last used.

While transmitting, for example, through a channel stored in the memory address "1", only the memory address indicator "1" is lit up. For further details, refer to "Details of Keyboard".

(16) Scan Step Switch (STEP)

This switch sets the frequency spacing by which frequency is scanned up or down. With the switch placed in the released out (A) position, the scan step is set to 5kHz (12.5kHz for European version) and with the depressed (B) position 10kHz (25kHz for European).

(17) Scan Mode Switch (B,V)

With the switch placed in the released out (B) position, scanning is carried out over the channels determined by the keyboard switches (SCAN M, P) and the M MODE switch. When an input signal higher than the squelch level determined by the SQL control is received, the scanning stops automatically at the channel for approx. 5 sec, and then resumes scanning automatically. To receive the channel for more than 5 sec, push one of [1], [2], [3], [4], [5] and [6] keys.

When the switch is placed in depressed (V) position, the scanning is carried out but it skips over busy channels and automatically stops at the first vacant channel encountered. Once a signal enters the vacant channel, the scanning is resumed until the next vacant channel is encountered.

(18) Tone Switch (TONE)

This switch is used to actuates an optional tone encoder if it is mounted inside the unit. Usually place the switch in the OFF position.

(19) Programmable Scan Mode Mark

This indicates programmable scan is carried out between the frequencies stored in M7 and M8 on either memory A and B banks.

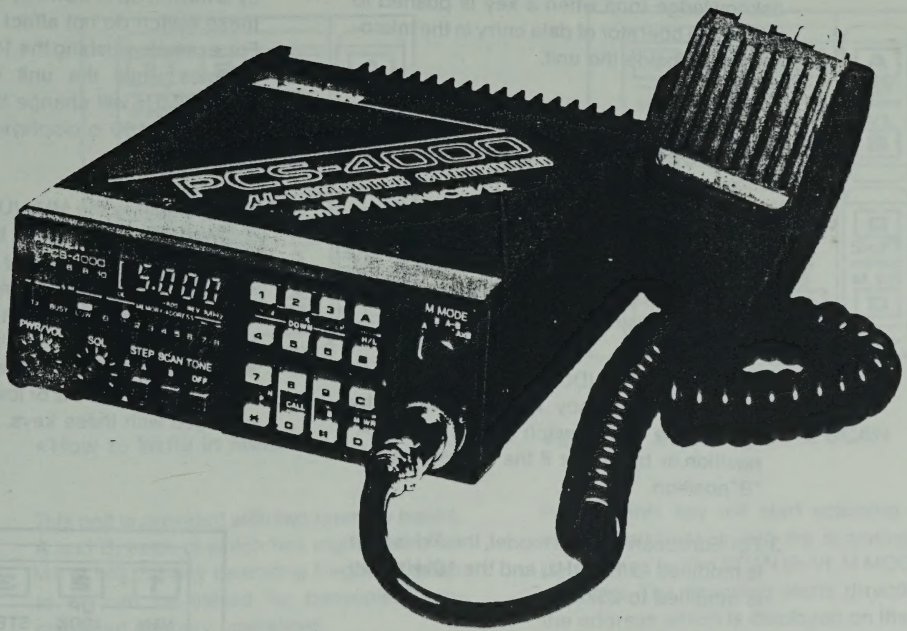
(20) Keyboard Switches

The keyboard switches are used to select various operation modes programmed inside the microcomputer.

All the keys are illuminated for easy location in darkness. Refer to "Details of Keyboard".

(21) Control Microphone Connector

This is used to connect the control microphone supplied with the unit. When connecting the microphone plug, do not attempt to force the plug onto the pins, it will slip on easily when the connector is properly aligned up. For detail of the microphone, refer to page15.



Microcomputer controlled, 2m FM transceiver, PCS-4000 (Front View)

DETAILS OF KEYBOARD

The keyboard is designed to keep proper brightness in the light during the daytime and sufficient brightness in the inside of a car at night. Temperature in the unit will rise slightly due to the illuminating lamp and the power amplifier, but this is normal.

★Acknowledge tone

This transceiver produces an electronic acknowledge tone when a key is pushed to inform the operator of data entry in the microcomputer inside the unit.

★Changing Channel Frequency. . . Tuning Operation (UP & DOWN)

1. When the STEP (UP)key [3] is pushed once, the operating frequency is moved up by 5kHz if the STEP switch (16) is set to "A" position, or by 10kHz if the STEP switch is set to "B" position.

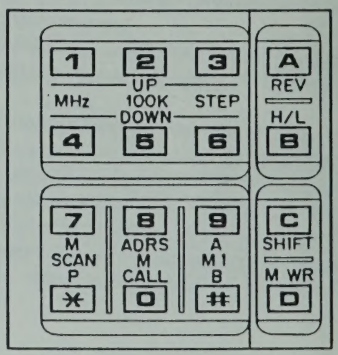
2. When the STEP (DOWN) key [6] is pushed once, the frequency is moved down by 5kHz if the STEP switch (16) is set to "A" position,or by 10kHz if the switch is set to "B"position.

3. For European version model, the 5kHz step is modified to 12.5kHz, and the 10kHz step is modified to 25kHz.

4. For example, if the STEP (UP) key is pushed 3 times with the STEP switch placed in "B" position, the frequency will be changed by 30kHz upward, or if the STEP (DOWN) key is pushed 15 times, the frequency will be changed by 150kHz downward.
However, the STEP key does not affect the MHz digit.

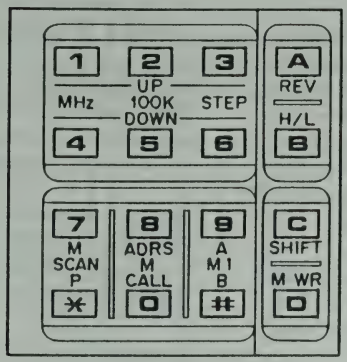
5. When pushing 100kHz STEP (UP) [2] or (DOWN)[5] key once, the operating frequency is moved up or down by 100kHz step, but these switch do not affect the MHz digit.
For example, pushing the 100kHz UP [2] key 3 times while the unit is operating at 145.800MHz will change the frequency to 146.100 (6.100 is displayed) MHz.

6. When pushing the MHz (UP) [1] key or MHz (DOWN) [4] key each time, the leftmost digit on the frequency indicator moves by 1MHz step up- or downward, respectively, thus changing the channel from low band to high band or vice versa within the specified assigned band (Refer to the specifications). However, the 100kHz or lower digits are not changed with these keys.



★Rapid Channel Change. . . (UP, DOWN)

By holding down the STEP (UP) 3 or the STEP (DOWN) 6 key for more than a half-second, the frequency is automatically changed up or down at a rate of eight steps per second. As the desired frequency is approached, release the key. Then repeatedly push the UP or DOWN key until the desired frequency is obtained.



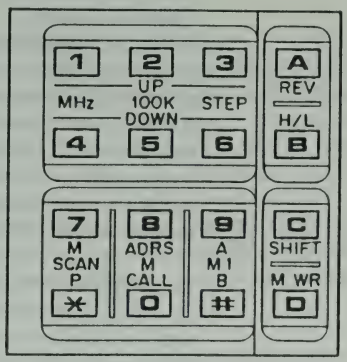
★How to Write in Memory

This unit is provided with two memory banks, A and B, each of which has eight memories M1 to M8. So any operating frequencies up to 16 can be stored for convenient programmed memory operations.

To store frequencies in the memories, proceed as follows:

1. Decide a frequency to be stored, and then obtain the frequency on the frequency indicator by using UP or DOWN keys, refer to "Channel Changing (UP-DOWN)".
2. Determine one of memory banks A or B by placing the M MODE switch in the "A" or "B" position.
3. Push the memory address key ADRS 8 on the keyboard until a desired memory address indicator is turned on.
4. Push the memory write key M WR D on the keyboard, then the frequency will be stored on the specified memory.

For example: Store 145.560MHz in the memory M3 on the B bank. First, obtain 5.560 display on the frequency indicator by using the UP or DOWN keys. Next, place the M MODE switch in the "B" position ("B" LED lights up) and push the memory address key M ADRS 8 several times until the M3 indicator lights up. Finally push the memory write M WR D key. As the result, 145.560MHz is stored in the M3 memory on the B bank with the indication of 5.560 on the frequency indicator.



★Memory Scanning. . . M SCAN

Pushing this key will start scanning of the memory addresses with the scanning mode determined by the SCAN (B-V), M MODE, etc. switches. The scanning starts directly after the address which is displayed on the memory address indicator.

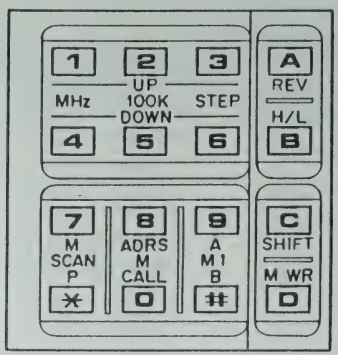
For example: Assume 144.100, 144.200, 144.300, 144.400, 144.500, 144.600, 144.700 and 144.800MHz are stored in the memories M1, M2, M3, M4, M5, M6, M7, and M8 on the memory bank A, respectively; and 145.100, 145.200, 145.300, 145.400, 145.500, 145.600 145.700 and 145.800MHz are stored in the memories M1, M2, M3, M4, M5, M6, M7 and M8 on the memory bank B, respectively.

1. When M2 on the A bank is lit and the M MODE switch is placed in the "A" postion, the scanning is carried out from 144.300 MHz, 144.400MHz...144.800MHz, 144.100 MHz..., in this sequence.

2. when the M MODE switch is placed in "B" position and M5 (of B bank) is lit, the scanning is carried out from 145.600MHz, 145.700MHz...145.800MHz, 145.100MHz... in this sequence.
3. When the M MODE switch is placed in "A-B" position and M2 is lit with B bank indicator not lit, the scanning is carried out from 144.300MHz... 144.800MHz, 145.100 MHz...(B bank LED is lit up)... 145.800MHz, 144.100MHz(B bank LED is turned off)...in this sequence.
4. When the M MODE switch is placed in "AxB" position, the scanning is carried out over the frequencies stored only in the A bank memories.

During all above scanning mode of operations, if the SCAN mode switch is placed in the "B"(Busy) position, the scanning stops automatically for approx. 5 sec when the unit receives a station. Whereas, if the SCAN mode switch is placed in the "V" (Vacant) postion, the scanning stops automatically at the first vacant channel encountered.

To stop the scanning manually, push one of [1] [2], [3], [4], [5], and [6] keys. Actuating the key again will perform the function indicated near the keyboard.
When you push another function key such as M1-A or M1-B (used to call the content of M1 on A or B bank) while scanning, the scanning stops immediately and the frequency indicator displays the content of M1-A or M1-B. Thus, you are ready to communicate immediately using the channel.
The scan stop threshold level is determined by the squelch control knob, so adjust the knob properly.



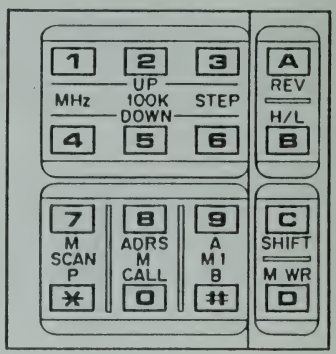
★Programmable Band Scanning. . . P SCAN

By pushing the P SCAN key [•], a specified frequency band between two frequencies stored in the memory M7 and M8 can be scanned repeatedly.
For example: if two frequencies "U" and "V" (U < V) are stored in the memories M7 and M8 on A bank memories, respectively; and other frequencies of "X" and "Y" are stored in the M7 and M8 memories on B bank, respectively, the frequency band between U and V are scanned with the M MODE switch placed in "A" postion, and the band between "X" and "Y" is scanned with the M MODE switch placed in "B" position.

With the M MODE switch placed in "A-B" or "AxB" position, both bands between "U & V" and "X" & "Y", or the band between "U" & "V" are scanned, respectively.

The scan stop mode depends upon the position of the SCAN (B = Busy, V = Vacant) switch set, and the scan stop sensitivity is determined with the SQL control knob.

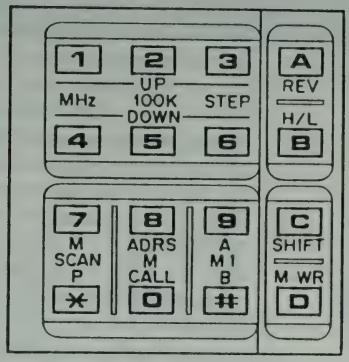
To stop the scanning push one of [1], [2], [3], [4], [5], and [6] keys.
To manually change the frequency, push UP or DOWN key as usual after the scanning is stopped.



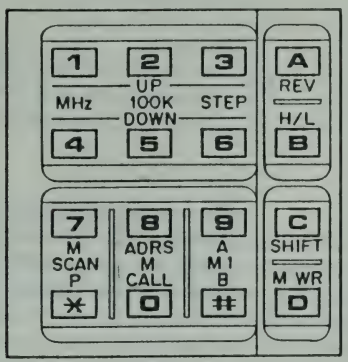
★Calling Frequency Stored. . .
M ADRS & M CALL

When calling a frequency stored one of 16 memories, first, place the M MODE switch in "A" or "B" position depending on the memory bank to be selected. Push the M ADRS [8] key repeatedly until a specified memory address indicator lights up. Then push M CALL [0] key and the frequency stored in the memory is called up and displayed on the frequency indicator.

Returning from the memory mode to the manual mode, push one of [1], [2], [4], [5], [6], key once.



Note: During M CALL key is actuated(or MM indicator is turned on), the key [3] performs the same function as that of M ADRS key.



★Calling Priority Channel Stored in M1. . . M1-A & M1-B

Two priority channels (frequencies) are provided in the M1 memory on both A and B memory banks for quick access to the channels used frequently.

To call the priority channel frequency stored in the M1 memory on "A" bank, simply push the M1 A [9] key, then the channel frequency stored is directly called up and displayed on the frequency indicator regardless of any current operation mode.

In the similar way, to call another priority channel stored in the M1 on "B" bank, push M1 B [#] key.

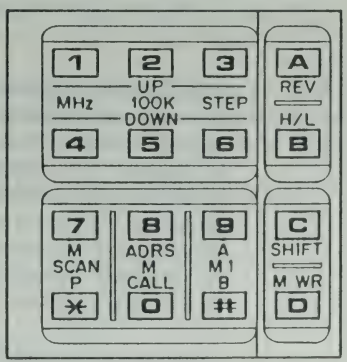
To return to the manual mode, push one of [1], [2], [4], [5], and [6], keys once.

★ ±600 kHz Shift. . .SHIFT

This key is used to offset the transmit frequency by ±600kHz from the receive frequency. When the SHIFT key [C] is pushed once +600kHz indicator(4) is turned on and the transmit frequency is shifted by +600 kHz when the PTT switch depressed.

Pushing the key [C] again makes −600kHz indicator(5) turn on and shifts the transmit frequency by −600kHz, when the PTT switch is depressed.

To disable the shift operation for normal simplex operation, push the key [C] one or twice until the +600kHz or −600kHz indicator is turned off.



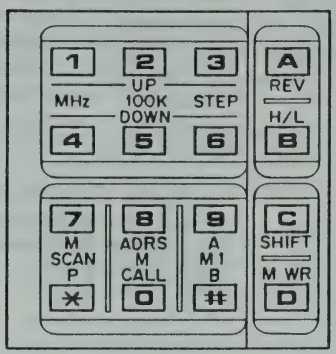
★Reverse Mode Operation. . .REV

This key allows transmit and receive frequencies to be reversed.

For example, assume that a receive frequency of 145.200MHz is set on the frequency indicator and + 600kHz offset is also set for the transmit operation. This means that the reception is carried out at 145.200MHz and the transmission is carried out at 145.800MHz.

With the REV [A] key pushed, each receive and transmit frequency is reversed, namely, reception is made at 145.800MHz and transmission is made at 145.200MHz.

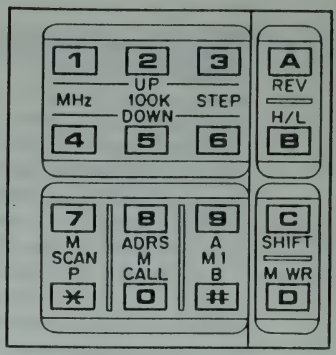
To disable the reverse operation, push the REV [A] key again, the REV indicator LED is turned off and indicates that the reverse mode is disabled.



★Transmit Power Switching. . . H/L

This key selects transmit power output of either 25W or 5W. When the power of the unit is turned on, the LOW power indicator LED (9) is turned on and the low power output of 5W is automatically selected. To select the high power output, push the H/L [B] key once, then the LOW power LED will be turned off, thus indicating the high power is selected.

To select the low power again, push the H/L key again.



★Band Scan Offset

Band scanning can be carried out even in repeater offset mode by storing + or − 600kHz in memory address M7 and M8 on either bank A or B.

Example:

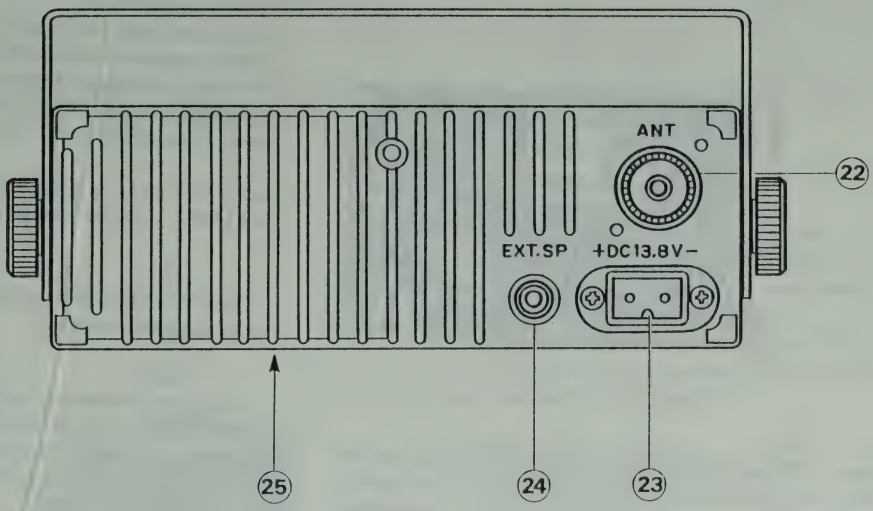
Store 146.100 and + 600kHz in M7
Store 146.200 and − 600kHz in M8
Scanning Step = 5kHz

When scanning begins at the frequency stored in M7, frequency indicator displays 6.100 and also + 600kHz indicator (4) will light up. Then, it keeps on displaying 6.105, 6.110, 6.115... up to 6.200 while − 600kHz indicator (5) remains lit up, then back to 6.100 with + 600kHz indicator lit up, resuming the same scanning as above.

In memory address 7 (M7), 6.100 of simplex mode can be stored and + or − 600kHz along with upper limit frequency can be stored in M8.

In short, channels (frequencies) just after that stored in M7 always carry offset memory information stored in M8.

REAR PANEL CONNECTORS



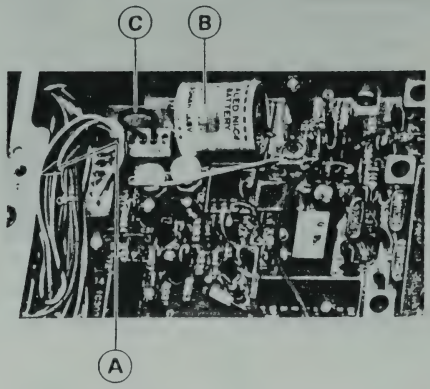
(22) Antenna Connector
The antenna connector is a SO239 type designed to mate with a PL259 type connector. The impedance of the antenna and the cable used should be 50 ohms. Some degree of mismatching is tolerable, but a severe mismatching will reduce the power output of the unit. The cable length should be kept as short as possible to minimize power dissipation.

(23) Power Connector
The unit is designed to be powered from 13.8V ± 15% DC, 5A or more power supply. The red lead of the power cord is positive and the black is negative ground.
When connecting the power cord to the power supply, be careful not to reverse the polarity.
Should the polarity be connected incorrectly, the 10A fuse connected in the positive power lead will blow to protect the unit. Never use a fuse other than the specified one.

(24) External Speaker Jack
This jack accepts a 3.5mm dia. mini-plug for connecting an external speaker to this unit. Connecting the plug to the jack automatically disconnects the built-in speaker.

(25) Built-in Speaker (Bottom of Unit)
Since the sound holes face downward, the unit should be located so as not to block these holes.
The speaker is of 8 ohm impedance type.

★HOW TO BACK UP MICROCOMPUTER MEMORY AND HOW TO CHARGE BATTERY



A C-MOS microcomputer (A) is employed in this unit. To take advantage of the power-saving characteristics of C-MOS, this unit is provided with a nickel-cadmium battery(B). It serves to back up the memory by the user. The nickel-cadmium battery has been fully charged before it leaves our factoy, so that no recharging is required for six months. However, after this unit has been stocked or displayed in the shop for a long period of time, the battery must be recharged.
After once charged, it is automatically charged each time the unit is operated. The battery is serviceable for more than three years in usual operating conditions.

★Method of initial charge (Generally, the battery will not require initial charge):

Remove the bottom cover of the unit and carefully detach the 4P connector equipped with loop lead (C).
Insert the 4P connector (supplied) equipped with red and black leads (1m) in place of the detached connector, and connect the red lead with the plus terminal of 13.8V power supply or a battery(12V) and black lead with the minus terminal, thereby starting to charge the battery.
Desirable charging time is 12 to 15 hours. However, the battery can be used for backing up the microcomputer memory by quick charge(5 to 6 hours).

After charging the battery, remove the charging connector in reverse order from above. Turn on the power switch and insert the 4P connector with loop lead while checking that "5.000" is displayed.
If charged with the polarity reversed, the nickel-cadmium battery will be damaged.
While the unit is operated, the battery is automatically supplied with a current (1/15 of usual charging current) for recharging.

Note: Be sure to turn OFF the power switch of the UNIT in case of charging.

★How to back up memory and how to prevent malfunction:

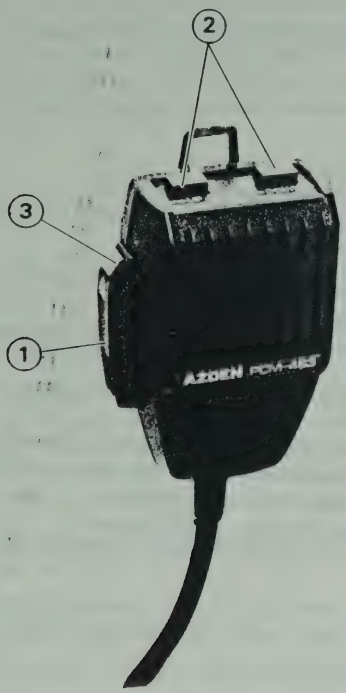
The content of memory stored by the user is backed up by the nickel-cadmium battery. However, if the unit is supplied incorrectly by mistake, the microcomputer or memory may sometimes malfunction.
If the microcomputer or memory malfunctions due to the abovementioned cause, take the following steps:
(1) Turn off the power supply.
(2) Remove the bottom cover of the control unit.
(3) Remove the 4P connector(C) with loop lead.
(4) Turn on the power supply.
(5) Check that the content of every memory is 5.000, with a display of "5.000".

After checking this state, insert the 4P connector with loop lead, with the power applied (where "5.000" is displayed).
Then, store your desired frequency in the memory.

IMPORTANT
If the memory back-up battery voltage lowers, the memory or display operation may fail to function properly. So if this is observed, immediately charge the battery.

MICROPHONE PCM-463

A multi-functional microphone is provided as a standard accessory. However your own microphone can be used with the transceiver through an optional microphone connector.



(1) Push-to-Talk Switch Lever

To transmit, depress the Push-to-Talk (PTT) switch and speak slowly and clearly in your normal tone of voice with the microphone about two inches from your mouth.

Depressing the PTT switch turns the TX indicator LED on the front panel, indicating that the transmitter is in operation.

(2) UP/DOWN Buttons

These UP and DOWN buttons function in the same way as those of STEP (UP) 3 and STEP (DOWN) 6 keys on the keyboard of the unit's front panel.

Depressing the UP or DOWN button each time, the frequency indicated on the frequency indicator is changed by the frequency step determined by the STEP switch on the front panel.

Holding either one of buttons for more than a half-second allows rapid frequency change.

(3) M1-A CALL Button

This M1 A CALL button has also the same function as that of M1 A priority key on the front panel key board.

By depressing the button, the priority channel stored in M1 memory on the bank A is directly called up regardless of current operation mode of the unit. Thus quick access to the channel which may be used frequently can be attained.

OPERATIONS

Reception

Before turning the power on, place the controls and switches as follows, and check that the antenna is correctly connected.

P WR/VOL: Turned fully counterclockwise
SQL: Turned fully counterclockwise
STEP A-B: Any position
SCAN B-V: B(Busy) position

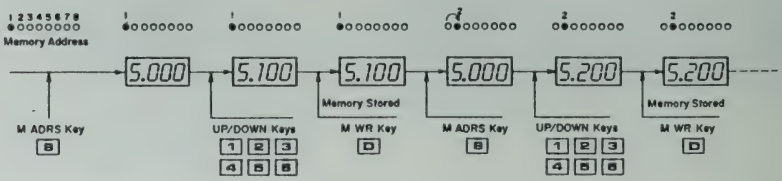
Make sure the microphone plug is connected firmly to the microphone jack on the front panel.

★How to Program the Memory

Suppose you want to write following frequencies in the memory bank "A":
M1, 145.100MHz; M2, 145.200MHz; M3, 145.300MHz; M4, 145.400MHZ; M5, 145.500MHz; M6, 145.600MHz; M7, 145.700MHz; M8, 145.800MHz.

(1) Assume that 145.500 is stored in all memories. Turn the power on.
(2) Place the M MODE switch in "A" position.
(3) Push Memory address key M ADRS repeatedly until memory address indicator LED "1" is turned on.
(4) Push UP or DOWN key properly until frequency display of 5.100 is obtained on the frequency indicator.
(5) Push memory write (M WR) key, and 145.100MHz will be stored in the M1 address memory.
(6) Push memory address (M ADRS) key to advance the memory address to M2.
(7) Push UP key until 5.200 is displayed on the frequency indicator.
(8) Push M WR key, and 145.200MHz will be stored in the M2 memory.
(9) Repeat procedures in the same way to store the remaining frequencies in the remaining memories M3 via M8.

Note: When storing frequencies in the "B" bank memories, place the M MODE switch in the "B" position. Then repeat steps as shown above.



★How to Use Priority Channels

Two channels can be designated for your own private priority channels, which may be channels used most frequently. First, decide the channel frequency(s) and then store the channel(s) in M1 memory(s) on either or both memory bank(s) A and B.

Example: Assume one of your priority channel is 145.330MHz, and another is 145.500MHz.

(1) First, store the 145.330MHz in the M1 address on the memory bank A with M MODE switch placed in the "A" position, as shown in preceding section.

(2) Next, store the 145.500MHz in the M1 address on the memory bank B with M MODE switch placed in the "B" position.

(a) To call up 145.330MHz, simply push M1-A key on the keyboard. The frequency 145.330MHz will be displayed regardless of any current mode of operation and you can communicate with your party through this channel.

(b) To call up 145.500MHz, simply push M1-B key, then frequency 145.500MHz will be displayed on the frequency indicator in the same way as above.

★How to Scan Channels Memoried

Assume that memories M1-M8 on the "A" bank has been stored with frequencies 144.100 through 144.800MHz as mentioned under "Memory Scanning... M SCAN" in this manual.

Example:

(A) To scan all M1 through M8 memories on the "A" bank with SCAN STOP mode of "Busy".

(1) Place the M MODE switch in "A" position.

(2) Place the SCAN switch in the released "B" postion.

(3) Push M SCAN 7 key.(Scanning will be started.)

(B) To scan all M1 through M8 memories on the "B" bank, simply place M MODE switch in the "B" position.

(C) To scan all M1 through M8 memories on both "A" and "B" memory banks, place M MODE switch in "A-B" position.

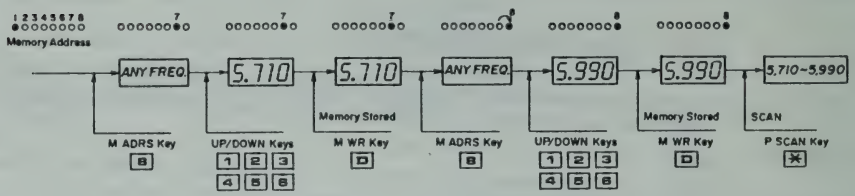
(D) When you want to scan for a vacant channel, place the SCAN switch in the depressed "V" position. (For further details, refer to "Memory scanning- M SCAN".)

★How to Scan a Specified Band

Example: Assume you want to scan channels from 145.710MHz to 145.990MHz using the memory bank A.

(1) Place M MODE switch in "A" position.
(2) Push ADRS [8] key repeatedly until memory address indicator M7 is turned on.
(3) Push UP or DOWN key properly to obtain frequency display of 5.710 on the frequency indicator.
(4) Push M WR [D] key.
(5) Push ADRS [8] key once to turn M8 indicator on.
(6) Push UP key(s) properly until frequency display of 5.990 is obtained.
(7) Push M WR [D] key.
(8) Push P SCAN [•] key. (scanning will be started.)

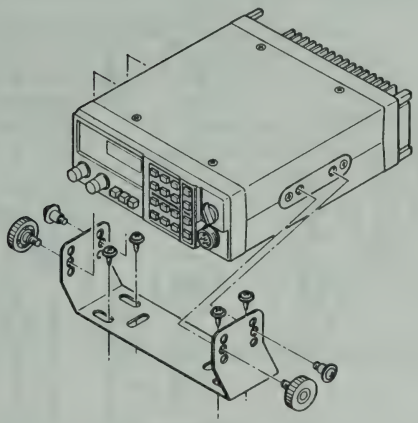
Note: 1. Place SCAN stop mode switch in "B" position when you want to find busy channels, or in "V" position to find vacant channels.
2. The scan stop level is adjusted with SQL knob.
3. For another mode of P SCAN, refer to "Programmable Band Scanning... P SCAN".
4. When storing frequencies in M7 and M8, always store lower frequency in M7 memory.



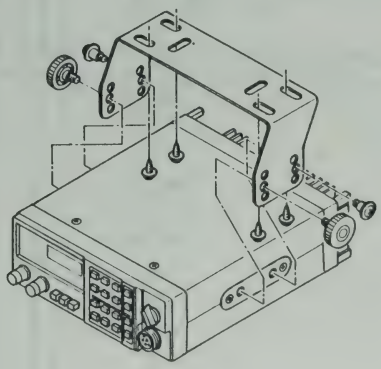
HOW TO INSTALL THE UNIT

1. Choose a convenient location that is protected from moisture and heat, and be sure that the unit will not interfere with your driving. Decide in advance the best way to route the antenna cable.
2. The mounting bracket may be used in two ways as shown below.
   Use the bracket as a template to mark where the mounting holes will be drilled.
3. Secure the bracket with self-tapping screws and washers.
4. Mount the unit with two washer-screws and two thumb screws. (Adjust tilt angle by properly selecting mounting holes as required.)
5. Connect antenna plug to antenna jack on rear of the unit.
6. Connect DC power plug to the DC 13.8V jack located on rear of the unit. This transceiver is designed for 12V DC use with negative ground electrical system only.

WARNING: Do not operate the unit before connecting antenna. Also make sure the unit is in the OFF position when making power and antenna connections.

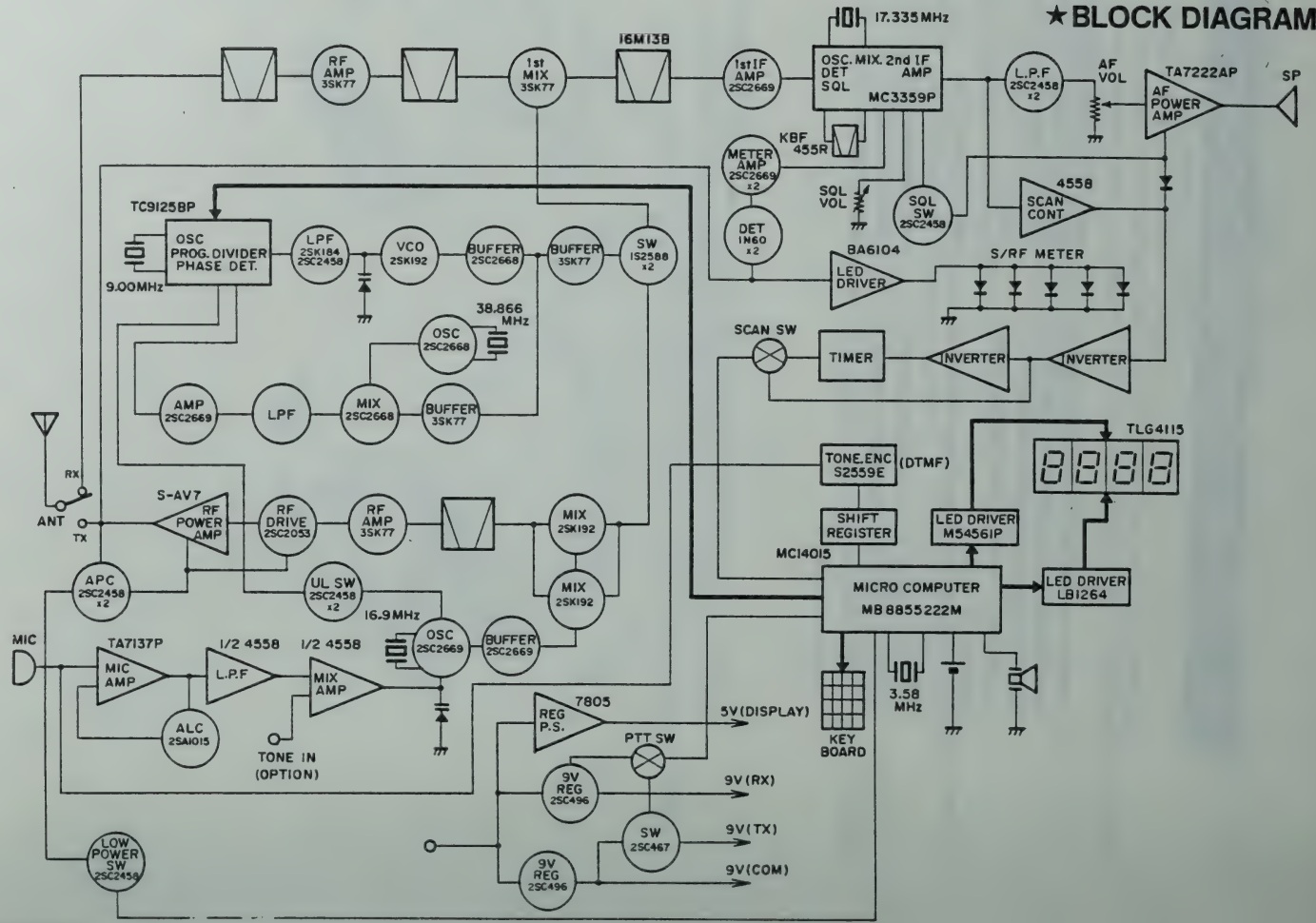


FLOOR MOUNT



UNDER DASH MOUNT

★BLOCK DIAGRAM



★ SPECIFICATIONS

(General specifications)

● Semiconductors	IC 15 pcs.(incluing μ-COM 1) FET 9 pcs. Tr 34 pcs. Di 70 pcs.
● Frequency band	142.000 to 149.995 MHz (U.S.A) 144.000 to 145.9875 MHz (Europe)
● Operating ambient temperature range	−10°C to +50°C
● Power supply voltage	13.8V ±15%
● Grounding polarity	Minus
● Current consumption	0.6 A max. for reception 6.0 A max. for transmission

(Transmitter)

● Transmitting output	25W(HIGH)(144~148MHz) 5W(LOW)
● Modulation method	Variable reactance frequency modulation
● Maximum frequency deviation	±5KHz
● Spurious	Better than −60dB with respect to fundamental
● Antenna impedance	50Ω
● Type of emission	F3
● Microphone used	500Ω dynamic type
● Tone Option(U.S.A)	Europe : 1750Hz, ±5KHz deviation

(Receiver)

● Receiving system	Double superheterodyne system
● Intermediate frequency	First : 16.90MHz Second : 455KHz
● Receiving sensitivity	0.2μV(144~148MHz) (12dB SINAD) RF input : 1μV or less for 30dB S/N
● Selectivity	±6KHz or more at 6dB down ±15KHz or less at 60dB down
● Audio output	2W or more (8Ω load and 10% distortion)

(Dimensions and Weight)

● Dimensions	50(H)×140(W)×172(D)mm (except projections)
● Weight	Approx.1.3kg

*Notice : Specifications are subject to change without notice for further technical improvement.

LIST OF ACCESSORIES

(1) Microphone PCM-463 ····· 1
(2) Microphone hanger ····· 1
Hanger mounting screw ····· 2
(3) DC power cord (with fuse, 10A) 1.5m ····· 1
Spare fuse, 10A ····· 2
(4) Mounting Bracket ····· 1
Washer-screw ····· 2
Thumb screw ····· 2
Mounting tapping screw ····· 4
Washer ····· 4
(5) 4-P connector for back up Batt. charge ····· 1

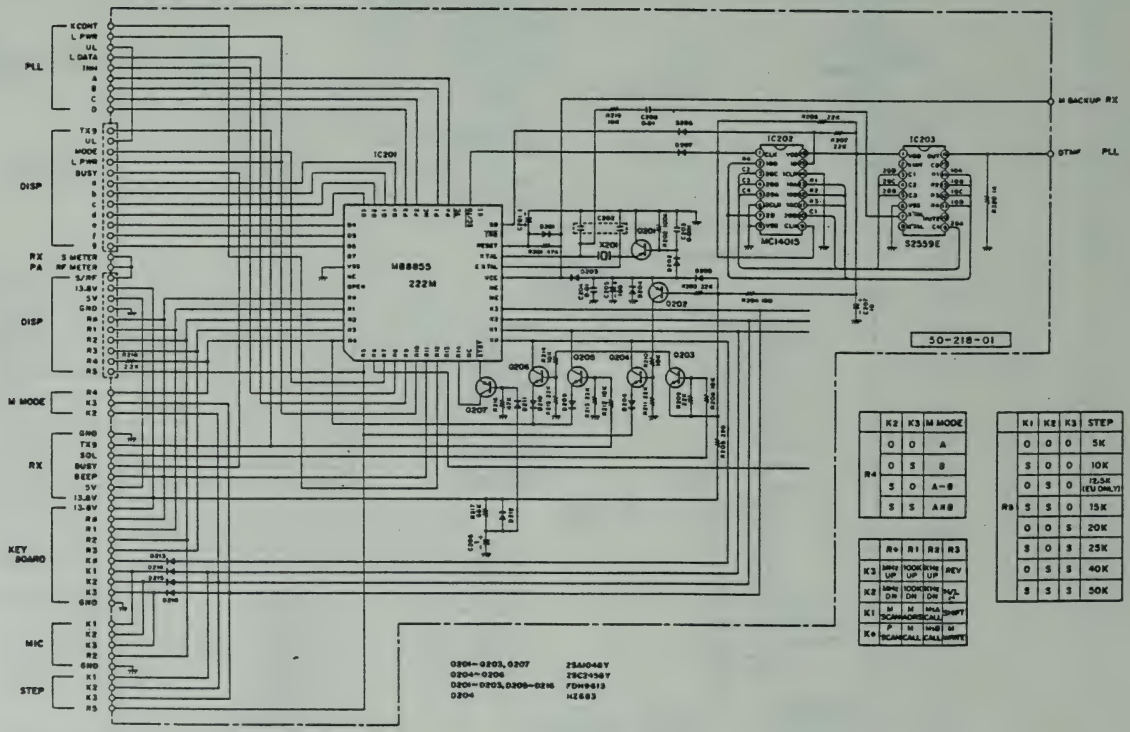
AZDEN®

JAPAN PIEZO CO., LTD.

1-12-17 KAMIRENJAKU, MITAKA, TOKYO 181, JAPAN

60-30706-01 PRINTED IN JAPAN ①

CONT



	K2	K3	M MODE
R4	0	0	A
	0	S	B
	S	0	A~B
	S	S	A≠B

	K1	K2	K3	STEP
R5	0	0	0	5K
	S	0	0	10K
	0	S	0	12.5K (EU ONLY)
	S	S	0	15K
	0	0	S	20K
	S	0	S	25K
	0	S	S	40K
	S	S	S	50K

	R0	R1	R2	R3
K3	MHz UP	100K UP	10K UP	REV
K2	MHz DN	100K DN	10K DN	MUTE
K1	M SCAN	M SCAN	MHz CALL	SHIFT
K0	P SCAN	M CALL	MHz CALL	M WRITE

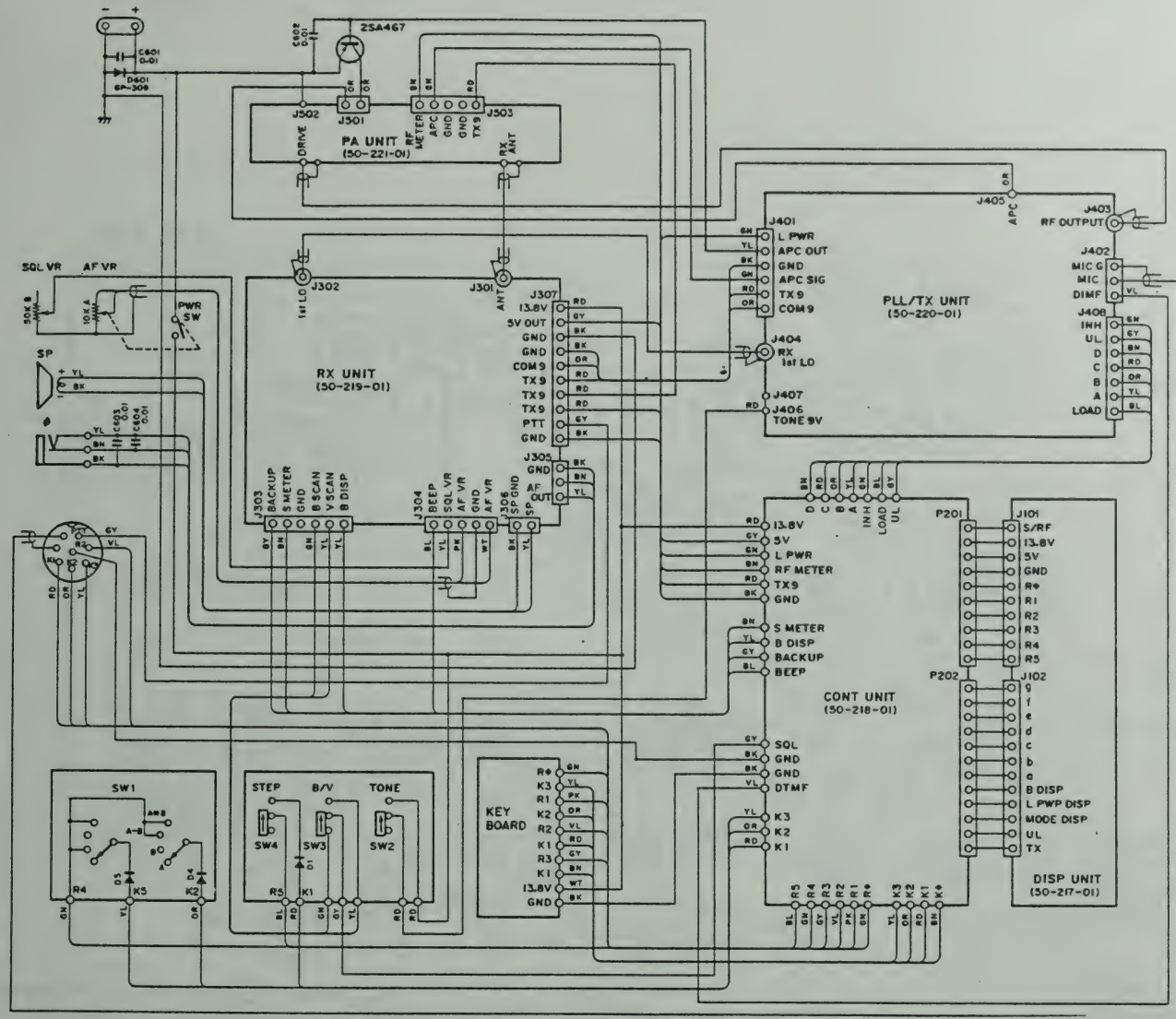
UNIT Ω
μF

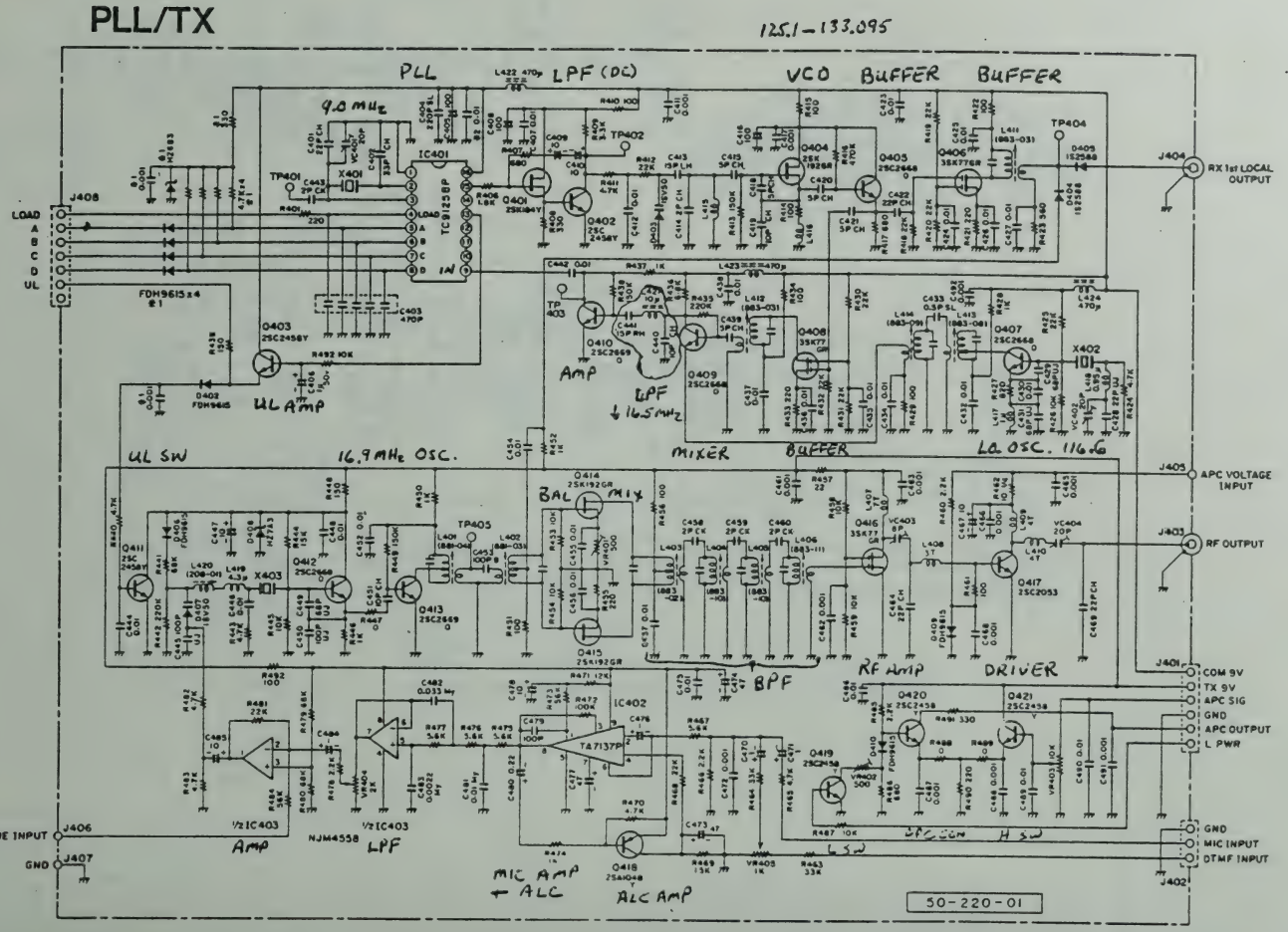
PROCESSING MOBILE TRANSCEIVER

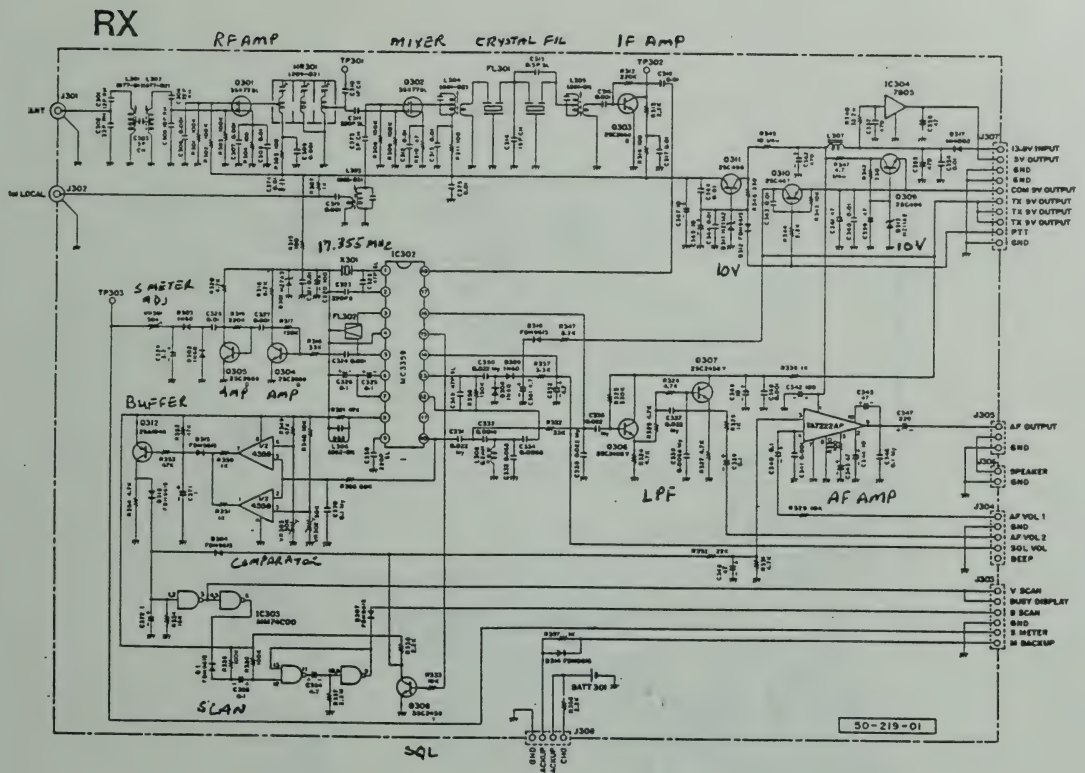
PCS-4000 SCHEMATIC DIAGRAM 01

QRV ELECTRONICS
503 MAIN STREET - 106-A
P. O. BOX 330
CRAWFORD, GA 30630
PH/FAX (706) 743-3344

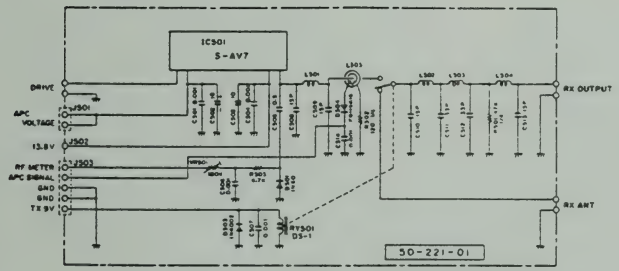
Some components subject to change for an improvement without notice.


2SA467
C601 0.01
D601 EA-308
C602 0.01
J502
J501
J503
DRIVE
PA UNIT
(50-221-01)
RF METER
APC
GND
TX9
RX ANT
J405
APC
J403
RF OUTPUT
J401
L PWR
APC OUT
GND
APC SIG
TX9
COM9
PLL/TX UNIT
(50-220-01)
J402
MIC G
MIC
DIMF
J408
INH
UL
D
C
B
A
LOAD
J404
RX 1st LO
J407
J406
TONE 9V
SQL VR
AF VR
50K B
10K A
PWR SW
SP
C603 0.01
C604 0.01
1st LO
ANT
J302
J301
J307
13.8V
5V OUT
GND
GND
COM9
TX9
TX9
TX9
PTT
GND
RX UNIT
(50-219-01)
J305
GND
AF OUT
SP
J303
BACKUP
S METER
GND
B SCAN
V SCAN
B DISP
J304
BEEP
SQL VR
AF VR
GND
AF VR
J306
SP GND
SP
D
C
B
A
INH
LOAD
UL
P201
J101
13.8V
5V
L PWR
RF METER
TX9
GND
S METER
B DISP
BACKUP
BEEP
S/RF
13.8V
5V
GND
R0
R1
R2
R3
R4
R5
CONT UNIT
(50-218-01)
P202
J102
g
f
e
d
c
b
a
B DISP
L PWP DISP
MODE DISP
UL
TX
DISP UNIT
(50-217-01)
SQL
GND
GND
DTMF
K3
K2
K1
SW1
STEP
B/V
TONE
SW4
SW3
SW2
D1
D3
D4
R4
K5
K2
R5
K1
KEY BOARD
R0
K3
R1
K2
R2
K1
R3
K1
13.8V
GND
R5
R4
R3
R2
R1
R0
K3
K2
K1
K0

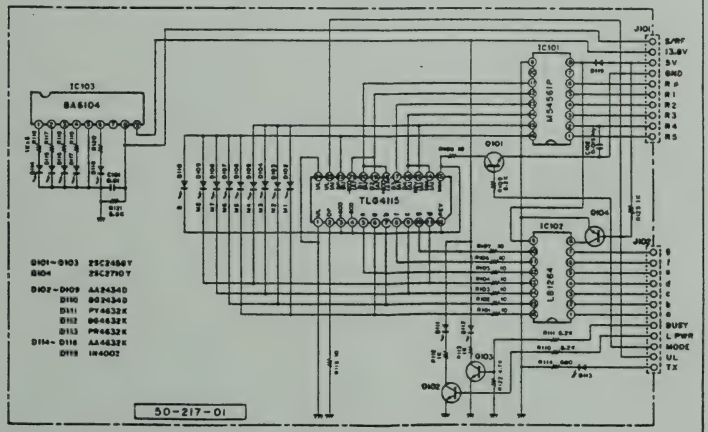

PLL/TX
125.1 – 133.095
PLL
LPF (DC)
VCO
BUFFER
BUFFER
9.0 MHz
RX 1st LOCAL OUTPUT
LOAD
A
B
C
D
UL
UL AMP
UL SW
16.9MHz OSC.
MIXER
BUFFER
LO. OSC. 116.6
APC VOLTAGE INPUT
RF OUTPUT
BAL MIX
BPF
RF AMP
DRIVER
COM 9V
TX 9V
APC SIG
GND
APC OUTPUT
L PWR
TONE INPUT
GND
Amp
LPF
MIC AMP
ALC
ALC AMP
GND
MIC INPUT
DTMF INPUT
50-220-01


RX
RF AMP
MIXER
CRYSTAL FIL
IF AMP
ANT
J301
J307
17.355 MHz
X301
IC307
TP303
S METER ADJ
BUFFER AMP
AMP
BUFFER
COMPARATOR
SCAN
SQL
LPF
AF AMP
IC304 7805
10V
13.8V INPUT
9V OUTPUT
GND
COM 9V OUTPUT
TX 9V OUTPUT
PTT
AF OUTPUT
SPEAKER
AF VOL 1
AF VOL 2
SQL VOL
BEEP
V SCAN
BUSY DISPLAY
D SCAN
S METER
M BACKUP
J308
50-219-01

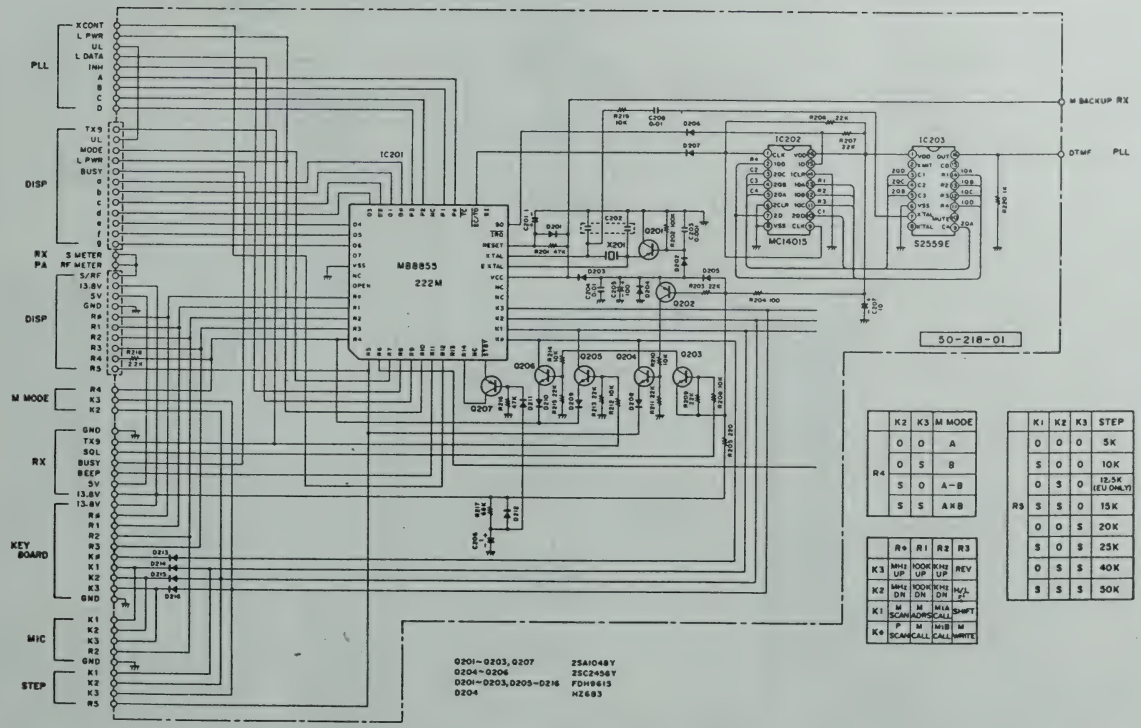
PA


IC501
S-AV7
DRIVE
APC VOLTAGE
13.8V
RF METER
APC SIGNAL
GND
GND
TX 9V
RX OUTPUT
RX ANT
50-221-01

DISP


IC103
BA6104
IC101
M54561P
IC107
L81264
TLC4115
Q101
Q104
Q103
Q102
J101
J102
S/RF
13.8V
5V
GND
R0
R1
R2
R3
R4
R5
BUSY
L PWR
MODE
UL
TX
Q101~Q103 2SC2458Y
Q104 2SC2710Y
D102~D109 AA2434D
D110 RG2434D
D111 PY4632K
D112 RG4632K
D113 PR4632K
D114~D116 AA4632K
D118 1N4002
50-217-01

CONT



R4	K2	K3	M MODE
	0	0	A
	0	S	B
	S	0	A-B
	S	S	A≠B

R5	K1	K2	K3	STEP
	0	0	0	5K
	S	0	0	10K
	0	S	0	12.5K (EU ONLY)
	S	S	0	15K
	0	0	S	20K
	S	0	S	25K
	0	S	S	40K
	S	S	S	50K

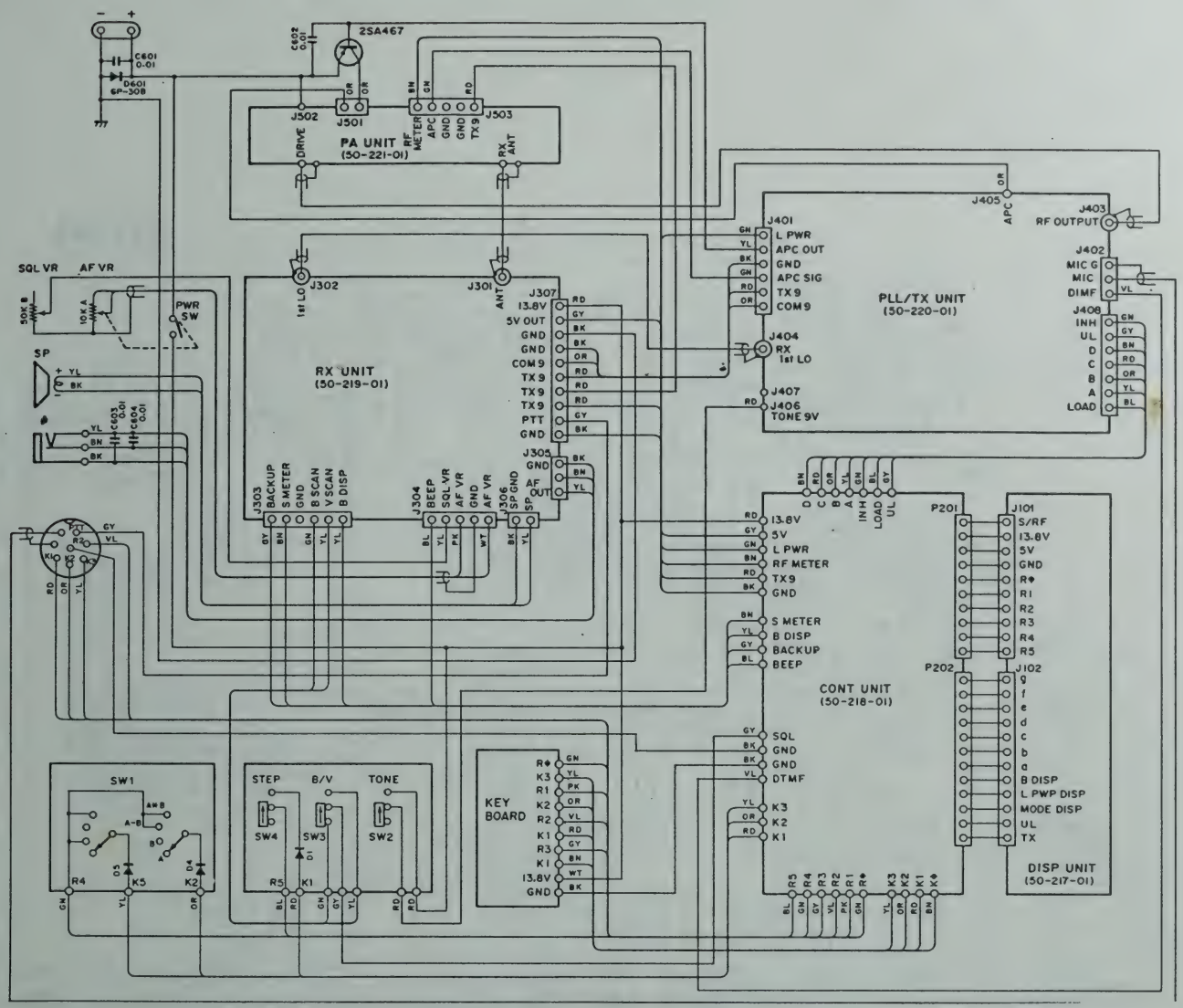
	R0	R1	R2	R3
K3	MHz UP	100K KHz UP		REV
K2	MHz DN	100K KHz DN		M/L
K1	M SCAN	M ADRS	M1A CALL	SHIFT
K0	P SCAN	M CALL	M1B CALL	M WRITE

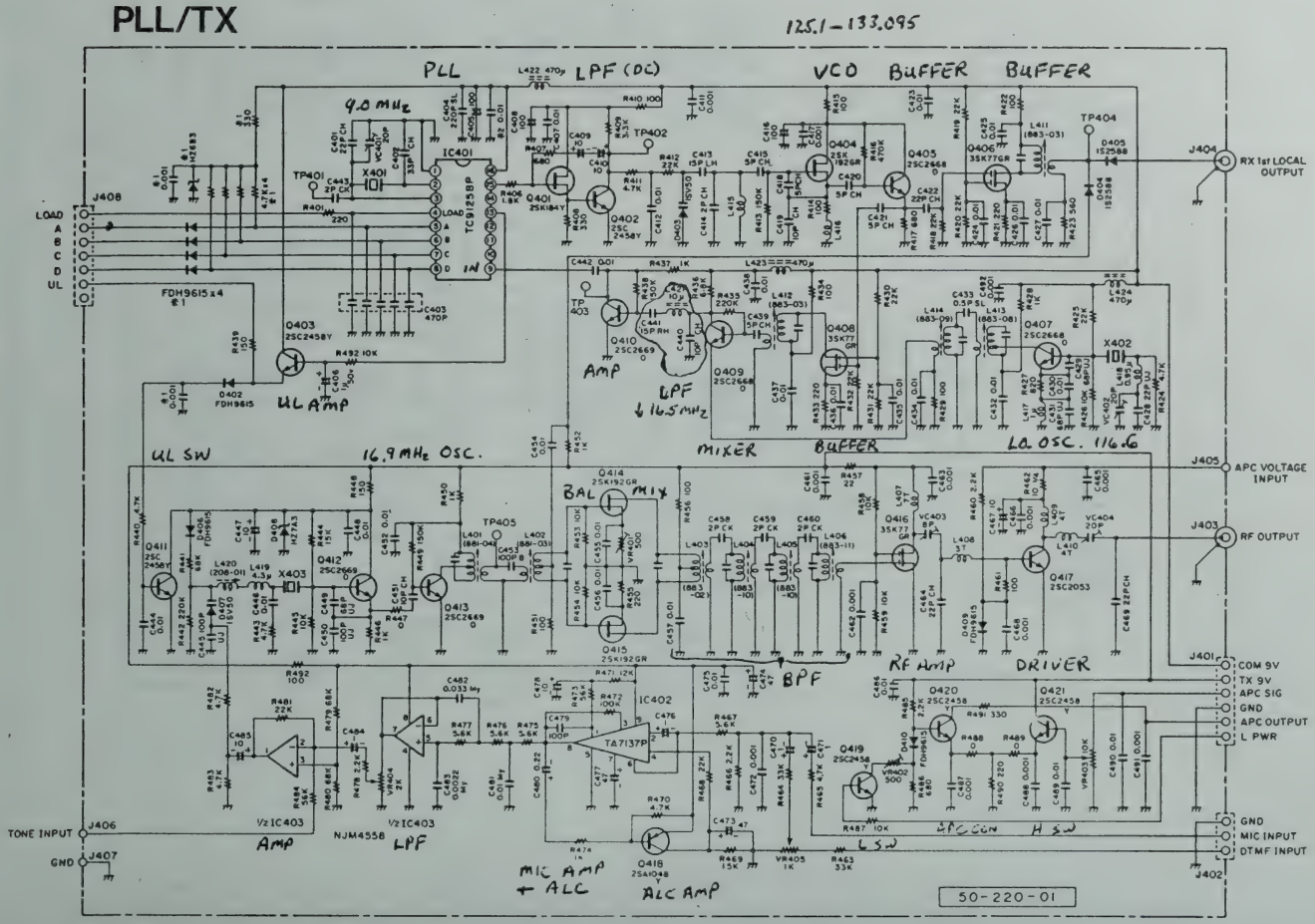
UNIT Ω
μF

Some components subject to change for an improvement without notice.

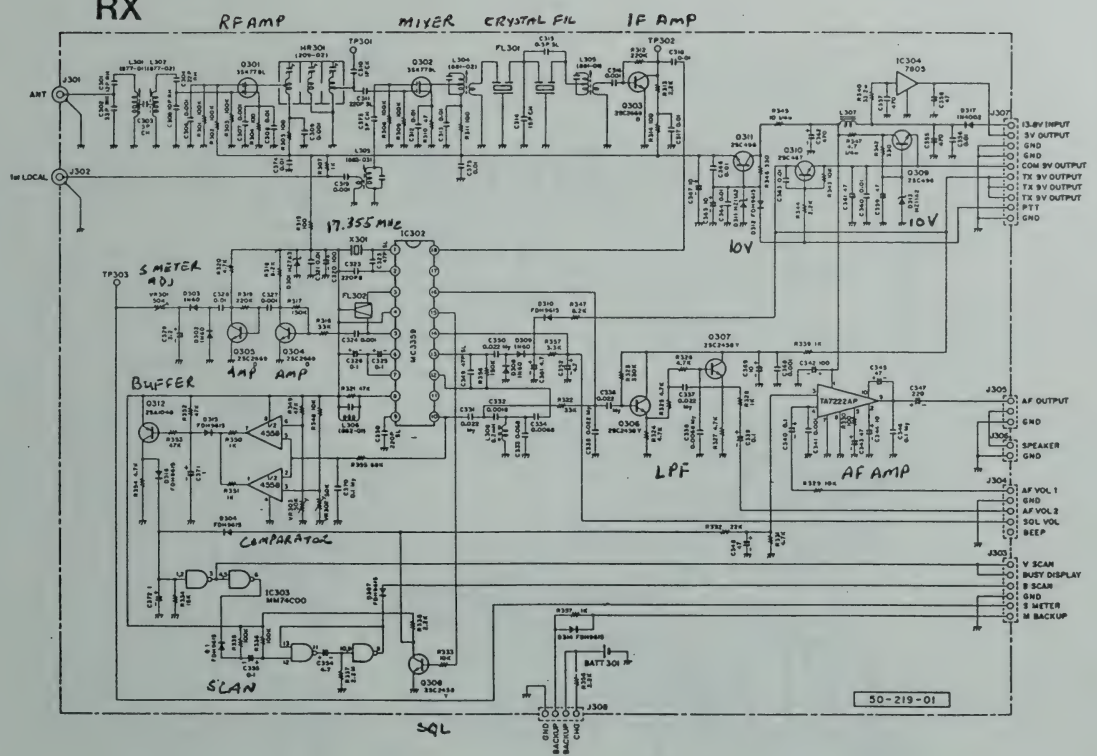
PROCESSING MOBILE TRANSCEIVER

PCS-4000 SCHEMATIC DIAGRAM (01)

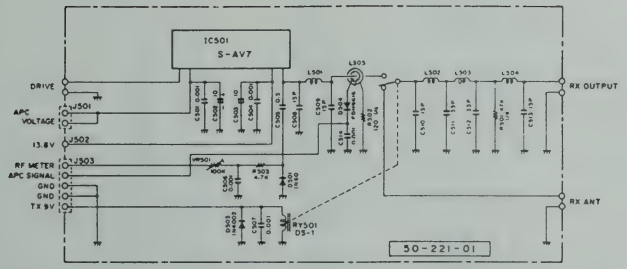

PA UNIT
(50-221-01)
RX UNIT
(50-219-01)
PLL/TX UNIT
(50-220-01)
CONT UNIT
(50-218-01)
DISP UNIT
(50-217-01)
KEY BOARD
2SA467
SQL VR
AF VR
PWR SW
SP
STEP
B/V
TONE
SW1
SW2
SW3
SW4
J101
J102
J201
J202
J301
J302
J303
J304
J305
J306
J307
J401
J402
J403
J404
J405
J406
J407
J408
P201
P202
RF OUTPUT
MIC G
MIC
DIMF
L PWR
APC OUT
APC SIG
TX9
COM9
RX 1st LO
TONE 9V
INH
UL
LOAD
13.8V
5V OUT
PTT
BACKUP
S METER
B SCAN
V SCAN
B DISP
BEEP
SQL VR
AF VR
AF OUT
SP GND
5V
RF METER
BEEP
SQL
DTMF
S/RF
R0
R1
R2
R3
R4
R5
L PWR DISP
MODE DISP
UL
TX


PLL/TX
125.1 – 133.095
PLL
LPF (DC)
VCO
BUFFER
BUFFER
9.0 MHz
IC401
TC9125BP
X401
TP401
TP402
TP404
J404
RX 1st LOCAL OUTPUT
J408
LOAD
A
B
C
D
UL
FDH9615 x4
#1
0403 2SC2458Y
UL AMP
0402 FDH9615
UL SW
16.9 MHz OSC.
0410 2SC2669
AMP
LPF 16.5MHz
0409 2SC2668
MIXER
BUFFER
LO. OSC. 116.6
0414 2SK192GR
BAL MIX
0415 2SK192GR
0411 2SC458Y
0412 2SC2669
0413 2SC2669
X403
TP405
RF AMP
DRIVER
0416 3SK77
0417 2SC2053
J405
APC VOLTAGE INPUT
J403
RF OUTPUT
J401
COM 9V
TX 9V
APC SIG
GND
APC OUTPUT
L PWR
0420 2SC2458
0421 2SC2458
0419 2SC2458
IC402
TA7137P
BPF
TONE INPUT
J406
GND
J407
1/2 IC403
NJM4558
AMP
1/2 IC403
LPF
MIC AMP + ALC
0418 2SA1048
ALC AMP
L SW
H SW
GND
MIC INPUT
DTMF INPUT
J402
50-220-01

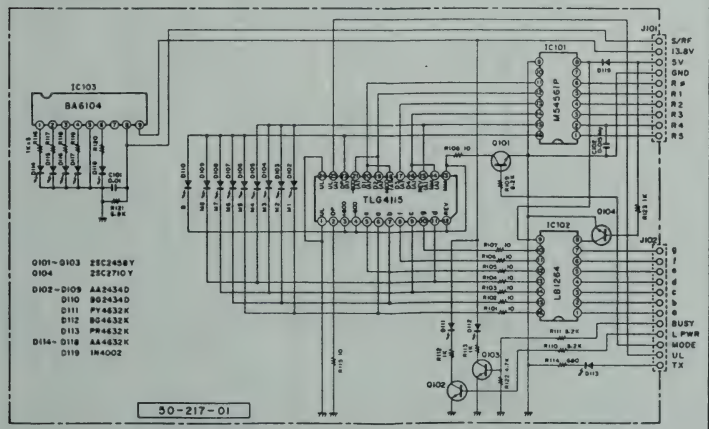
RX


RF AMP
MIXER
CRYSTAL FIL
IF AMP
ANT
J301
1st LOCAL
J302
17.355 MHz
IC302
X301
TP303
S METER ADJ
BUFFER
1ST AMP
2ND AMP
COMPARATOR
IC303 MM74C00
SCAN
SQL
LPF
AF AMP
TA7222AP
IC304 7805
10V
J307
13.8V INPUT
5V OUTPUT
GND
GND
COM 9V OUTPUT
TX 9V OUTPUT
TX 9V OUTPUT
TX 9V OUTPUT
PTT
GND
J305
AF OUTPUT
GND
J306
SPEAKER
GND
J304
AF VOL 1
GND
AF VOL 2
SQL VOL
BEEP
J303
V SCAN
BUSY DISPLAY
B SCAN
GND
S METER
M BACKUP
J308
GND
BACKUP
CLOCK
DATA
BATT 301
50-219-01

PA


IC501
S-AV7
DRIVE
APC VOLTAGE
13.8V
RF METER
APC SIGNAL
GND
GND
TX 9V
RX OUTPUT
RX ANT
50-221-01

DISP


IC103
BA6104
IC101
M54561P
IC102
LB1264
TLG4115
Q101~Q103 2SC2458Y
Q104 2SC2710Y
D102~D109 AA2434D
D110 BG2434D
D111 PY4632K
D112 BG4632K
D113 PR4632K
D114~D118 AA4632K
D119 1N4002
J101
S/RF
13.8V
5V
GND
R5
R1
R2
R3
R4
R5
J102
B
7
6
5
4
3
2
1
0
BUSY
L PWR
MODE
UL
TX
50-217-01

PCS-4000 ADJUSTMENT AND SERVICE MANUAL

1. TESTING EQUIPMENT

In order to fully adjust and service the Azden PCS-4000, the following test equipment will be required:

(a) Frequency counter
(b) Spectrum Analyzer
(c) Tracking generator
(d) Wattmeter (50 ohms impedance)
(e) Directional Coupler
(f) Linear Detector
(g) Standard Signal Generator
(h) SINAD Meter
(i) Audio Oscillator (600 ohms output impedance)
(j) Oscilloscope
(k) RF Voltmeter (input impedance above 100K ohms)

2. DISASSEMBLY PROCEDURE

Refer to the operating manual. Remove top and bottom cabinets first. Be sure to use screwdrivers of the correct size.

3. TOOLS FOR ADJUSTMENT

Do not use metal tools for adjusting ferrite cores. This will cause changes in inductance while adjustments are being made. It also increases the risk of damage to the cores. An adjustment driver made of plastic or bakelite is recommended.

4. CIRCUIT OPERATION

4-1. Outline

The PCS-4000 is a 2-meter (142.000 to 149.995 MHz) FM amateur-band transceiver, developed primarily for automobile installations. It employs a four-bit CMOS microcomputer for all frequency-control functions. Fig. 1 is a block diagram illustrating the functional operation of the PCS-4000.

4-2. Display Section

The display section is functionally illustrated in Fig. 2. The layout of components is shown in Fig. 3.

Note 1: The SW in Fig. 2 and D119 in Fig. 3 serve to prevent current flow from the microcomputer output ports (R and O) during memory back-up periods (power switch OFF).

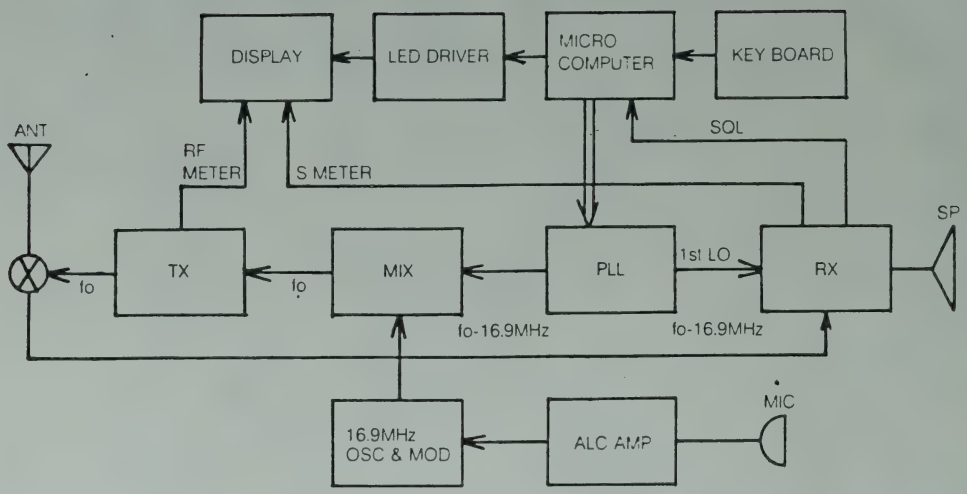

DISPLAY
LED DRIVER
MICRO COMPUTER
KEY BOARD
ANT
RF METER
S METER
SQL
SP
TX
MIX
PLL
1st LO
RX
fo
fo
fo-16.9MHz
fo-16.9MHz
MIC
16.9MHz OSC & MOD
ALC AMP

Fig. 1

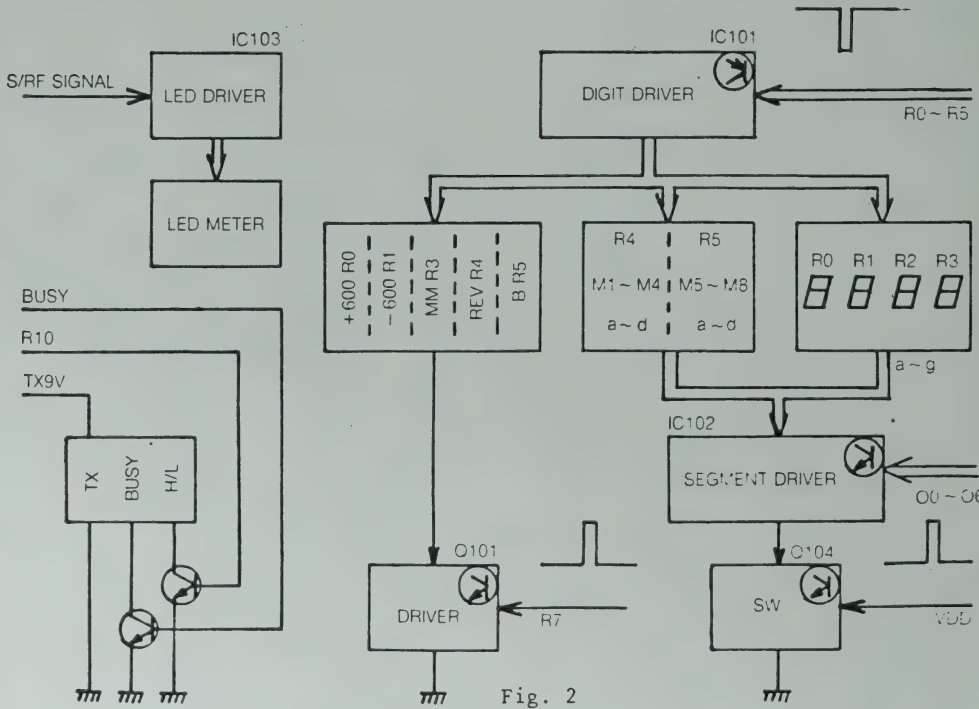

IC103
S/RF SIGNAL
LED DRIVER
LED METER
BUSY
R10
TX9V
TX
BUSY
H/L
IC101
DIGIT DRIVER
R0 ~ R5
+600 R0
–600 R1
MM R3
REV R4
B R5
R4
R5
M1 ~ M4
M5 ~ M8
a ~ d
a ~ d
R0
R1
R2
R3
a ~ g
IC102
SEGMENT DRIVER
O0 ~ O6
Q101
DRIVER
R7
Q104
SW

Fig. 2

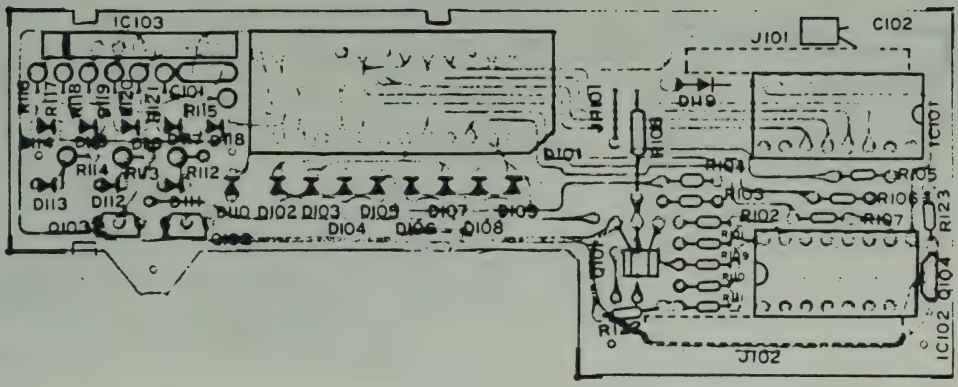


Fig. 3

Note 2: The external appearance of the frequency display LEDs is bright green, which is the same as in the PCS-3000 2-meter FM transceiver. However, the PCS-4000 uses common-anode type diodes, while the PCS-3000 employs common-cathode types. This is important when replacing diodes.

Note 3: In the mounted position, the longer wire leads of diodes D102 through D118 are the anode leads.

4-3. Control Section

The control-section component layout is shown in Fig. 4, and a functional block diagram is given by Fig. 5.

4-3-1. Operating Precautions for Key Matrix

As can be seen from Fig. 4, the control section is built around the four-bit CMOS microcomputer MB8855. The operation of the MB8855 is determined by shorting of the output ports R and the key input ports K. The combinations are listed in Tables 1 through 4.

As we can see from Table 5, the division frequency of the PLL programmable divider for the 144-MHz band in the EU (European) mode is 12.5 kHz, and in the JP (Japanese) and US (United States) modes it is 5 kHz. Therefore, Table 2 should not be used in an attempt to perform conversion between the EU mode and the JP or US modes. To convert the unit, it is necessary to change the frequency of the

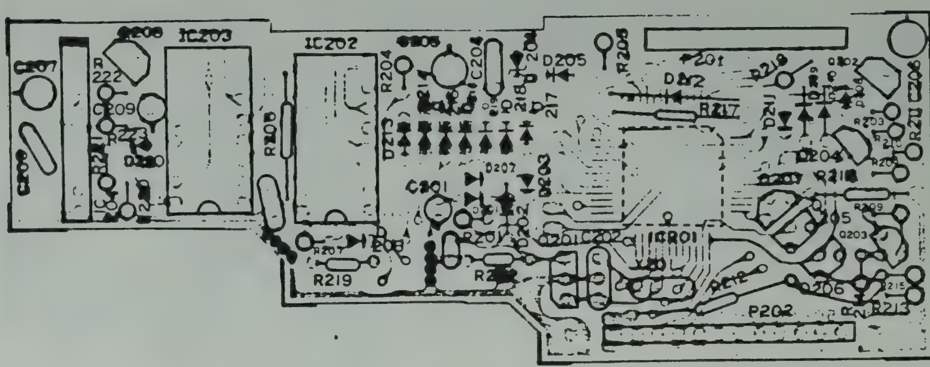

IC203
IC202
C207
C209
C204
D205
P201
R217
C201
R219
P202

Fig. 4

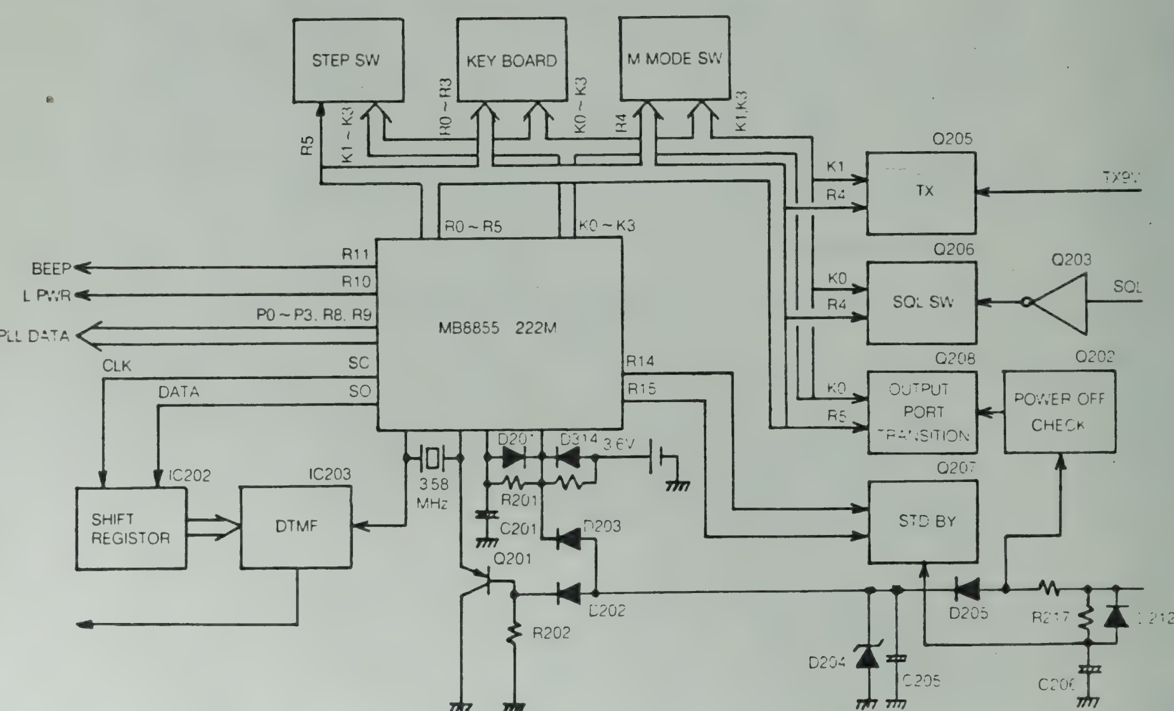

STEP SW
KEY BOARD
M MODE SW
R5
K1 ~ K3
R0 ~ R3
K0 ~ K3
R4
K1,K3
R0 ~ R5
K0 ~ K3
BEEP
L PWR
PLL DATA
R11
R10
P0 ~ P3, R8, R9
CLK
SC
DATA
SO
MB8855 222M
R14
R15
Q205
K1
R4
TX
TX9V
Q206
K0
R4
SQL SW
Q203
SQL
Q208
K0
R5
OUTPUT
PORT
TRANSITION
Q202
POWER OFF
CHECK
Q207
STD BY
IC202
SHIFT
REGISTOR
IC203
DTMF
3.58
MHz
D201
D314
3.6V
R201
C201
D203
Q201
D202
R202
D204
C205
D205
R217
C206

Fig. 5

222M KEY MATRIX

Table 1: STEP

	R5							
	5K	10K	12.5K	15K	20K	25K	40K	50K
K1	0	0	0	0	S	S	S	S
K2	0	0	S	S	0	0	S	S
K3	0	S	0	S	0	S	0	S

Table 2: BAND

Freq BAND	R6						
	144/US	144/JP	144/EU	430	28	50	
K3	0	0	0	0	S(D_{216})	S(D_{218})	
K2	0	0	S(D_{218})	S(D_{218})	0	0	
K1	0	S(D_{217})	0	S(D_{217})	0	S(D_{217})	

Table 3: M MODE

	R4			
	A	B	A−B	A×B
K3	0	S(D_3)	0	S(D_2)
K2	0	0	S(D_3)	S(D_2)

Table 4: KEY

	R1	R1	R2	R3
K1	MHZ UP	100K UP	STEP UP	REV
K2	MHZ DN	100K DN	STEP DN	H/L
K3	M SCAN	M ADRS	MIA CALL	SHIFT
K4	P SCAN	M CALL	MIB CALL	M WRITE

Table 5

Freq BAND	DISP/N	SHIFT
144/US	2.000 ~ 9.995	±0.600
	1700 ~ 3299	
144/JP	4.000 ~ 5.995	±0.600
	2100 ~ 2499	
144/EU	4.000 ~ 5.995	±0.600
	680 ~ 839	
430	0.000 ~ 9.995	±5.000
	1100 ~ 2099 × 2	
28	8.000 ~ 9.995	±0.100
	1700 ~ 2099	
50	0.000 ~ 3.995	±1.000
	1700 ~ 2499	

crystal in the PLL section. For the steps in Table 1, a combination of multiples of 5 for the JP and US modes, and multiples of 12.5 for the EU mode, is possible. But a combination where the multiples will not match is impossible using the steps in Table 1. For example, a combination of 10 kHz and 12.5 kHz is not possible, but 12.5 kHz / 25 kHz is possible, and 5 kHz / 25 kHz is also possible.

4-3-2. Microcomputer Initialization

This unit incorporates an initialization circuit that operates automatically whenever the power is switched ON. If the display shows an irregular or random indication, the initialization circuit is probably at fault. Disconnect P308 on the RX circuit board to interrupt the backup power supply, and set the power switch from OFF to ON. Automatic initialization is performed by C201, R201, and D201. For memory backup, leave the power switch in the ON position after re-initialization, and re-connect P308. The backup power-supply voltage should, at this time, be at least 3.6 volts. If it is below 3.6 volts, the memory backup battery must be charged.

4-3-3. TX Processing (K1 - R4)

When the transmitting voltage TX 9V causes Q205 to conduct, K1 - R4 is shortened. Thus the input operation to the microcomputer (Table 4) is stopped, and a serial signal is produced for operation of the DTMF IC. Then, depending on the selected split mode, the transmit offset processing is performed. IC202 is a shift register, which changes the DTMF serial signal from the microcomputer into an 8-bit parallel signal, to be supplied to IC203.

4-3-4. SQL Processing (K0 - R4)

When Q206 becomes conductive because of the SQL signal, K0 - R4 is shorted. When the scan operation (either the memory or programmable scan) is performed, scanning is interrupted while K0 - R4 is shorted. When K0 - R4 opens again, scanning is resumed.

4-3-5. Memory Backup Processing

When the STDBY terminal becomes low, the unit enters the standby mode. Then, it is necessary that Vcc be maintained for 13 command cycles (approximately 45 uS). Then, the backup power supply is used.

In order to carry out this operation, Q202 detects the

power OFF condition, making Q208 conduct and K0 - R5 become short-circuited. At this time, the microcomputer Vcc voltage is maintained by C205, allowing continued operation. When K0 - R5 is shorted, all output ports of the microcomputer are set to their determined condition, and R14 becomes low. As Q207 conducts while the power is OFF, R15 also becomes low and standby operation is initiated. When C205 is discharged and Vcc becomes smaller than the backup battery voltage, D203 switches OFF and power is supplied from the battery. Because Q201 also conducts in this situation, the clock pulse oscillation ceases. The re-setting of all output ports to their determined condition serves to prevent current from flowing from the output ports to peripheral circuits; this would lead to excessive backup current. However, because the output ports may not enter their determined settings under certain software conditions, a diode is inserted on the PLL board to prevent current from flowing from the PLL code output port.

The standby mode is released when Q207 becomes OFF (due to re-application of power to the unit). If the standby mode is discontinued too early, the microcomputer sends out the PLL code before the PLL IC has reached stable operation; this would create an unlocked condition of the PLL, but it is kept in lock by an automatic delay of the backup release time, effected by R217 and C206.

4-3-6. PLL Data

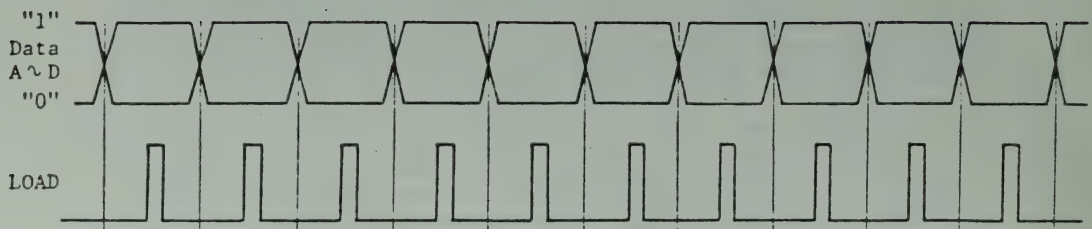
PLL data are supplied in Fig. 6. The ZNH signal is high, except for frequencies of 144.000 to 145.995 (in the 144/US mode).

4-4. PLL Section

The PLL IC is diagrammed in Fig. 7, and the entire PLL section is diagrammed in Fig. 8.

4-4-1. IC401 (TC9125BP)

As shown in Fig. 7, this IC incorporates a four-digit programmable counter which operates up to approximately 16 MHz. It also contains a reference frequency divider, a phase comparator, and related circuitry for PLL operation. The selection of the programmable divider division frequency and the IC operation mode (generally 5 kHz in the 144/US mode and 12.5 kHz in the 144/EU mode) are performed by a four-bit, parallel, five-digit serial input. Details of this input signal are shown in Fig. 6. The LD terminal carries the output signal in the unlocked condition.



		Address designation of unit's	Data set of unit's	Address designation of ten's	Data set of ten's	Address disigination of hundred's	Data set of hundred's	Address disigination of thousand's	Data set of thousand's	Address designation of mode setting	Data set of mode setting
Data Input	A	1	A_1	0	A_2	1	A_3	0	A_4	1	A_5
	B	1	B_1	0	B_2	0	B_3	1	B_4	1	B_5
	C	0	C_1	1	C_2	1	C_3	1	C_4	1	C_5
	D	1	D_1	1	D_2	1	D_3	1	D_4	1	0
		F=11	F=0∿9	F=12	F=0∿9	F=13	F=0∿9	F=14	F=0∿9	F=15	F=0∿7

Fig. 6

4-4-2. Voltage-controlled Oscillator (VCO)

The low-pass filter made up of Q401, Q402 and related circuitry extracts the DC component of the signal fed from the phase comparator in IC401. This DC voltage serves to control the VCO. The oscillation frequency range is 125.1 to 133.095 MHz (127.1 to 128.9875 MHz for the 144/EU mode). The oscillating frequency is obtained by mixing the first receiving IF, 16.9 MHz, with the operating frequency. This output is fed to the receiver mixer stage and the transmitter first local oscillator and PLL mixer stage by separate buffers.

4-4-3. PLL Local Oscillator and Mixer

The local oscillator serves to convert the output from the VCO into a frequency that can drive the programmable counter. The input frequency to the programmable counter is

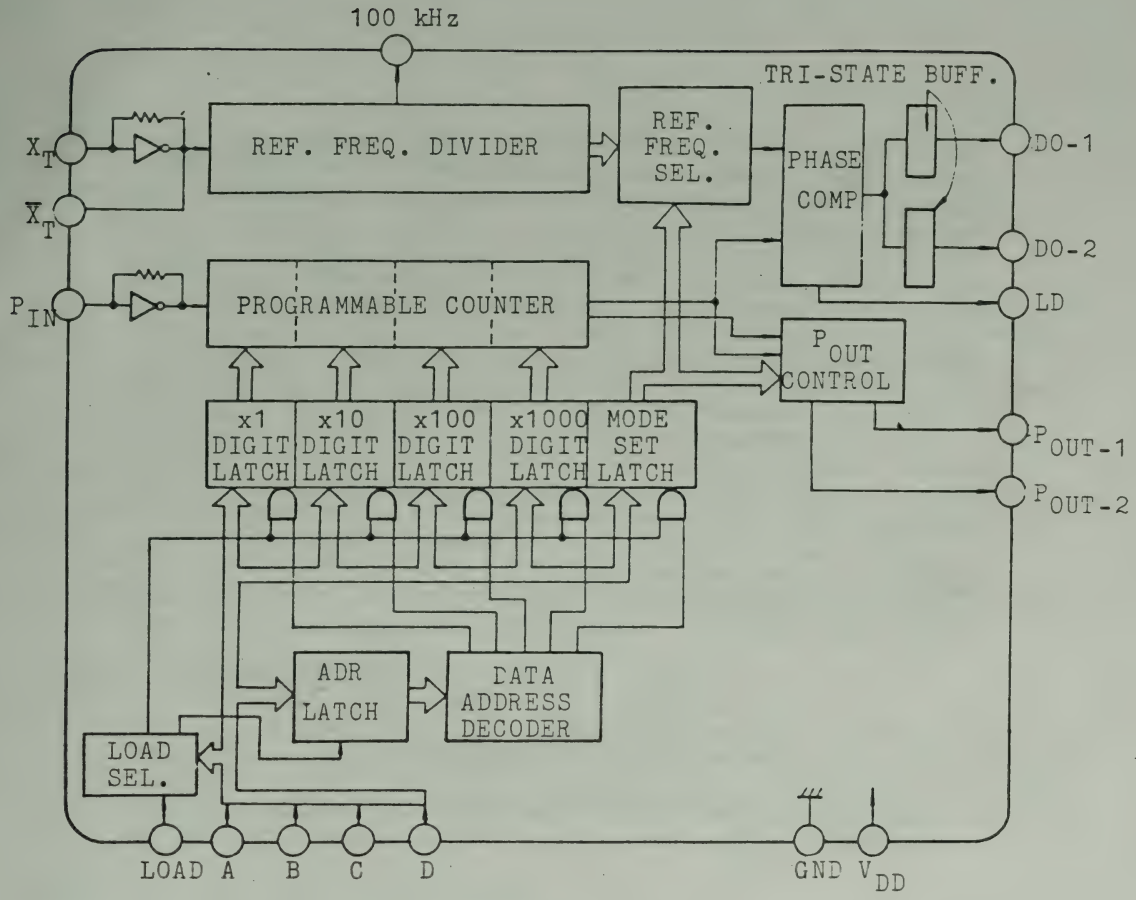

100 kHz
TRI-STATE BUFF.
REF. FREQ. DIVIDER
REF. FREQ. SEL.
PHASE COMP
DO-1
DO-2
LD
PROGRAMMABLE COUNTER
P OUT CONTROL
x1 DIGIT LATCH
x10 DIGIT LATCH
x100 DIGIT LATCH
x1000 DIGIT LATCH
MODE SET LATCH
P OUT-1
P OUT-2
ADR LATCH
DATA ADDRESS DECODER
LOAD SEL.
LOAD A B C D
GND V DD

Fig. 7

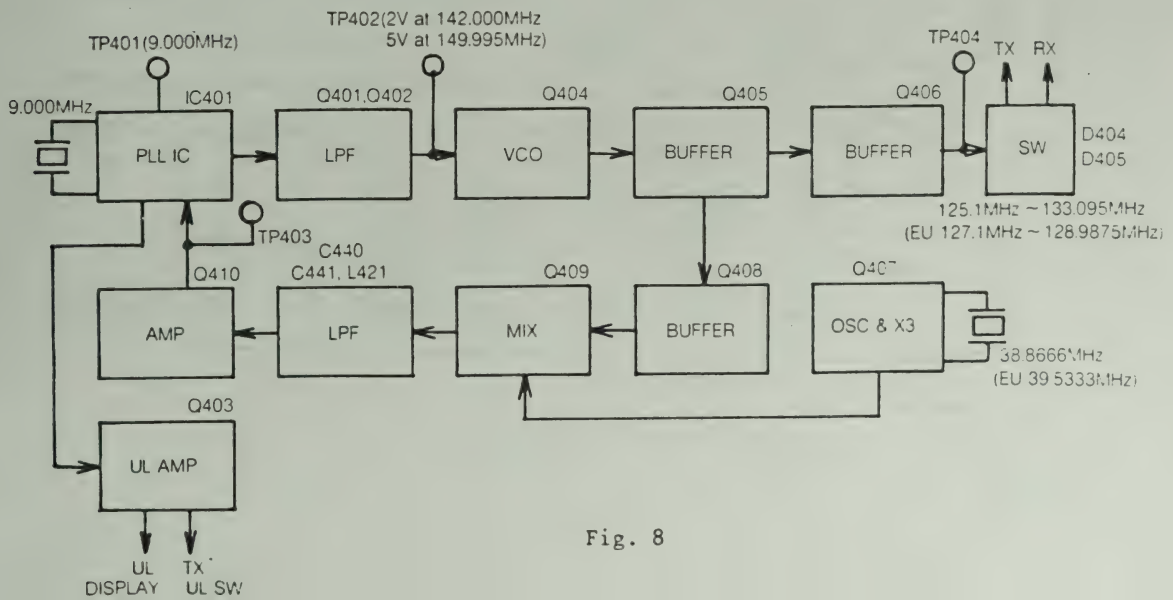

TP401(9.000MHz)
TP402(2V at 142.000MHz
5V at 149.995MHz)
TP404
TX RX
9.000MHz
IC401
PLL IC
Q401,Q402
LPF
Q404
VCO
Q405
BUFFER
Q406
BUFFER
SW
D404
D405
125.1MHz ~ 133.095MHz
(EU 127.1MHz ~ 128.9875MHz)
TP403
C440
C441, L421
Q410
AMP
LPF
Q409
MIX
Q408
BUFFER
OSC & X3
38.8666MHz
(EU 39.5333MHz)
Q403
UL AMP
UL DISPLAY
TX UL SW

Fig. 8

set at 16.9/2 MHz to 16.9 MHz, with 8.5 MHz at the lowest receiving frequency of 142.000 MHz (144.000 MHz for EU mode). Therefore, the necessary local-oscillator frequency becomes

142.000 - 16.9 - 8.5 = 116.6 MHz (US mode)
144.000 - 16.9 - 8.5 = 118.6 MHz (EU mode)

The crystal frequency is thus

116.6/3 = 38.8666 MHz (US mode)
118.6/3 = 39.5333 MHz (EU mode)

This local oscillator signal is combined with the VCO output at Q409, and the low-pass filter (LPF) extracts the signal below 16.5 MHz, which is amplified by Q410 and fed to the programmable counter of IC401. The divisor N of the programmable counter at the lowest receiving frequency is therefore

N = 8.5 MHz / 5 kHz = 1700 (US mode)
N = 8.5 MHz / 12.5 kHz = 680 (EU mode)

4-5. Transmitter and Modulator Sections

A block diagram of the transmitter and modulator sections is shown by Fig. 9.

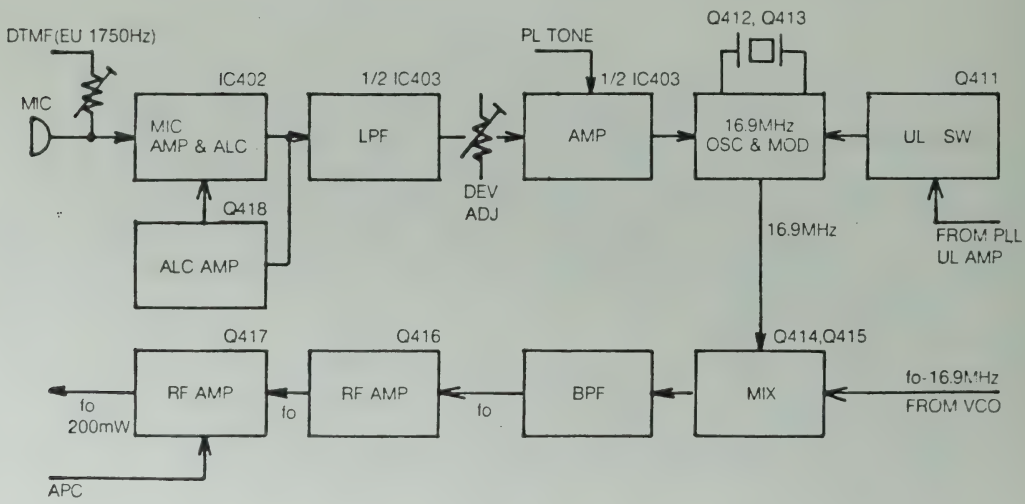


Fig. 9

4-5-1. Modulator Section

The TA7137P integrated circuit, IC402, is an audio amplifier with built-in ALC. When the microphone input exceeds a certain level, the ALC prevents further increase in amplitude. The output is fed to a tertiary active low-pass filter, which operates as a splatter filter. Then the signal is amplified at the adder circuit together with the PL tone. The output is used to directly frequency modulate the 16.9-MHz crystal oscillator circuit. Because the audio signal and the PL tone signal are added at the op-amp adder, there is no mutual interaction between them and their levels can be adjusted independently. As the crystal is directly frequency modulated, there is a minimum of distortion, even when a low audio frequency such as the PL tone is injected.

When the PLL becomes unlocked, the UL (unlock) signal from the PLL activates Q411 to stop the 16.9-MHz oscillator.

4-5-2. Transmitter Section

The signal from the VCO and the modulated 16.9-MHz signal are combined at the balanced mixer, consisting of Q414 and Q415. Then the desired frequency, f_o, is extracted at the bandpass filter and amplified by Q416 and Q417 to a level of approximately 200 mW.

4-6. RF Power Amplifier Section

The equivalent circuit of the Hybrid IC, S-AV7, for the PCS-4000 power amplifier is shown in Fig. 10.

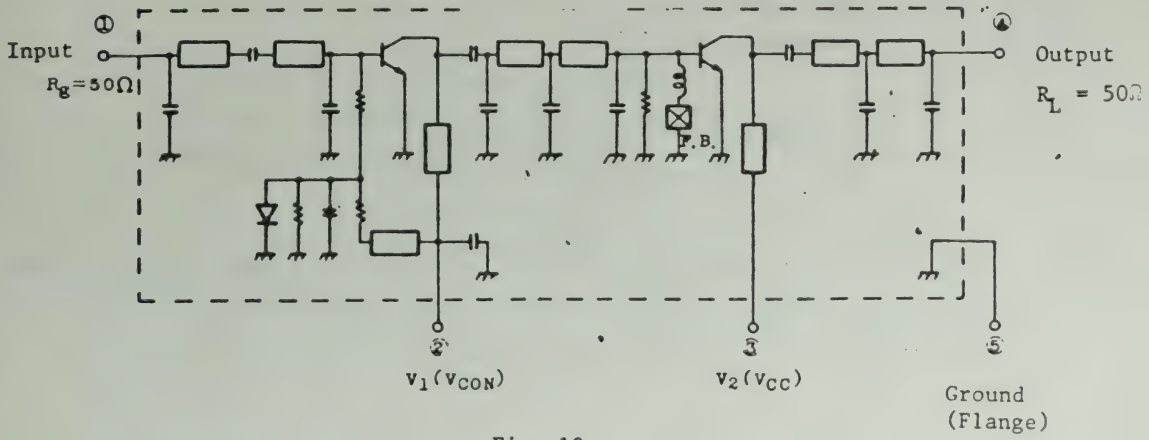


Fig. 10

This IC is designed to produce an output of more than 25 W with an input of approximately 100 mW. The output is supplied to the antenna via a four-stage low-pass filter which suppresses high-frequency harmonics. Switching between transmit and receive is performed by a relay, designed to withstand more than 150,000 ON/OFF operations with 30-W current.

4-7. Receiver Section

A block diagram of the receiver section is shown in Fig. 11. As can be seen from this diagram, the receiver section

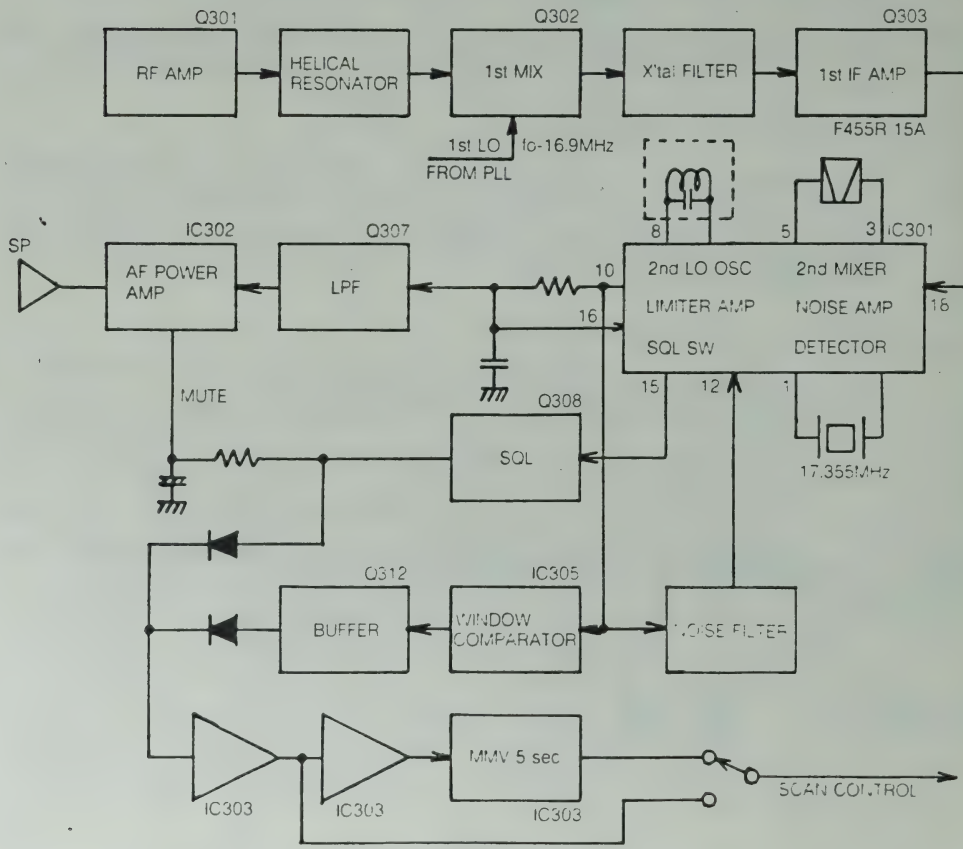


Fig. 11

employs an ordinary double-conversion type superheterodyne system. The first IF is 16.9 MHz and the second IF is 455 kHz. For RF amplification, and in the first mixer stage, MOSFETs (3SK77BL) are used. In the second mixer stage, second local oscillator, limiter amplifier, discriminator, noise amplifier, squelch, and others, the one-chip IC, MC3359 is used. This IC has good limiter characteristics and provides excellent noise-quieting sensitivity. The 5-kHz-step scanning control circuit, which operates with the discriminator to sense the center of the channel as well as the presence of carrier, assures that the PCS-4000 will stop on the correct frequency when band scanning. (This is the same circuit as that employed in the PCS-3000.)

4-8. Discriminator Scan Control

The approximate characteristics of the quadrature detector, employing the MC3359P, are shown in Fig. 12.

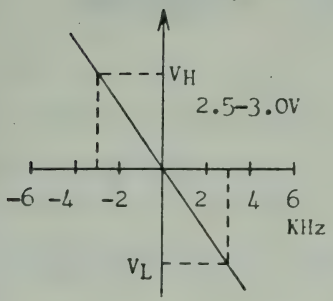


Fig. 12

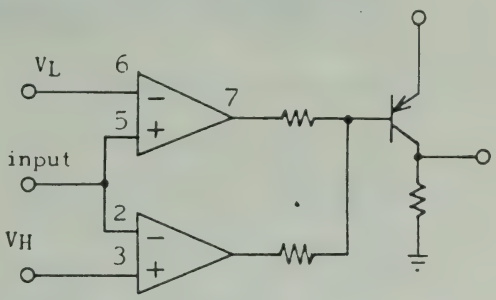


Fig. 13

By setting up a window comparator as shown in Fig. 13, with V_L and V_H (from Fig. 12) as reference voltages, a low output is obtained for frequencies within 3 kHz of the center frequency, and a high voltage is obtained for frequencies farther away than ±3 kHz. The logical AND of this output voltage and the scanning control output of the MC3359P will open the squelch when f_o is within ±3 kHz. Without this circuit, the scanning would stop prematurely.

5. ADJUSTMENT

5-1. PLL Section (Fig. 14)

5-1-1. Adjustment of Reference Frequency

* Connect a frequency counter to TP401.
* Adjust VC401 for a frequency counter reading of 9.0000 MHz, to within 100 Hz.

5-1-2. Adjustment of Mixer Stage

* Set the PCS-4000 frequency display to 6.000 (5.000 for European model).
* Connect an oscilloscope to TP402.
* Adjust L411, L412, and L413 until the amplitude of the waveform, displayed on the oscilliscope, is maximum. This amplitude should be 4 to 6 volts, and the cycle is 0.08 uS or approximately 12.5 MHz.
* If the VCO frequency is incorrect by a large amount, the PLL will fall out of lock and the above adjustment cannot be performed. In this case, first adjust L415 until the PLL becomes locked. Then perform the above procedure.

5-1-3. Output Adjustment

* Set the PCS-4000 frequency display to 6.000 (5.000 for European model).
* Connect an oscilloscope (bandwidth above 200 MHz) or an RF voltmeter (bandwidth above 200 MHz) and a frequency counter to TP404.
* Adjust L411 for a maximum indication on the oscilloscope or RF voltmeter. The indication should be between 0.5 and 1.5 volts peak-to-peak.
* Adjust VC402 for a frequency counter reading of 129.1000 MHz, to within 100 Hz.

5-1-4. Adjustment of VCO Control Voltage

* Set the PCS-4000 frequency display to 2.000 (4.000 for European model).
* Connect a DC voltmeter with an internal resistance of at least 20,000 ohms per volt.
* Adjust L415 for a voltmeter reading of 2.0 volts plus or minus 0.1 volt. (For the European model, this should be 2.8 volts plus or minus 0.1 volt.)
* VCO control voltage should be observed to increase as the PCS-4000 frequency is increased.

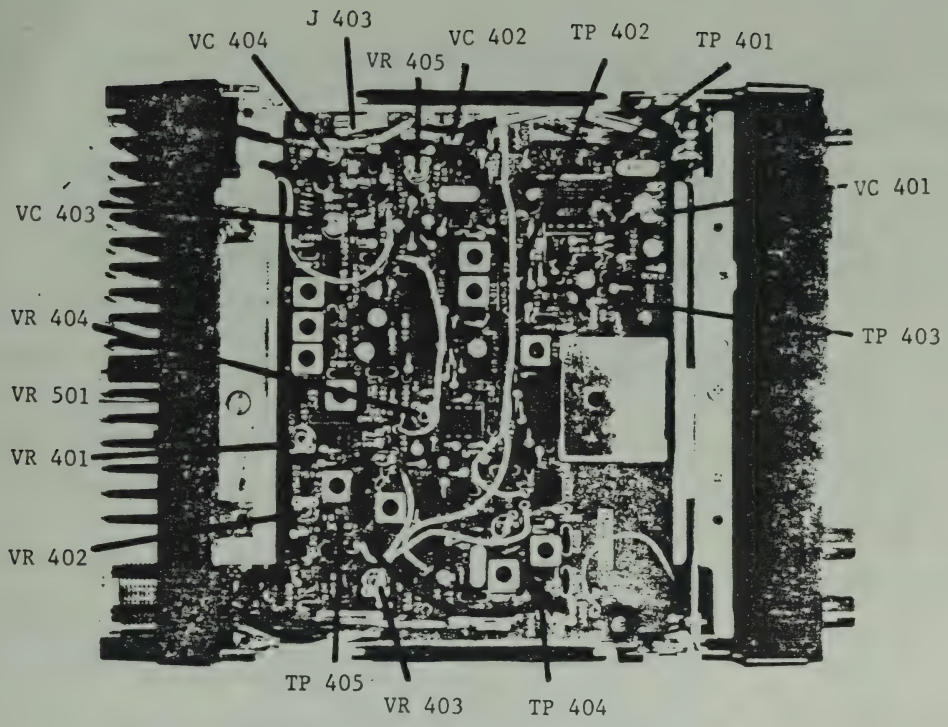

J 403
VC 404
VC 402
TP 402
TP 401
VR 405
VC 401
VC 403
VR 404
TP 403
VR 501
VR 401
VR 402
TP 405
VR 403
TP 404

Fig. 14

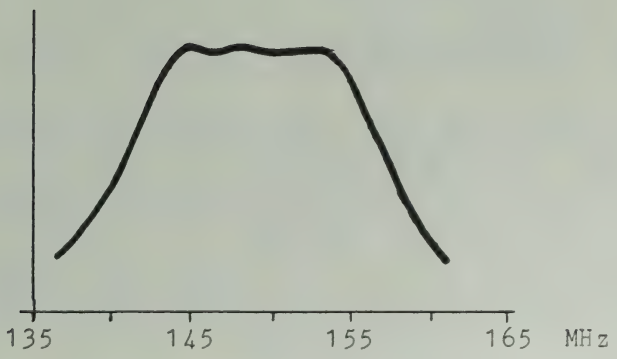

135
145
155
165
MHz

Fig. 15

5-2. Transmitter Section (Fig. 14)

5-2-1. Bandpass Filter Adjustment

* Connect a spectrum analyzer, of 50 ohms input impedance, to J403. Use an attenuator if needed. The maximum output from J403 is 26 dBm.
* Apply the output from a tracking generator to TP403.
* Turn VR401 fully counterclockwise.
* Ground the front-panel side of R415 with a clip lead. This will prevent the VCO from oscillating.
* Push the PTT lever on the microphone to put the unit in the transmit mode. Adjust L403, L404, L405, L406, VC403, and VC404 to obtain a spectrum-analyzer waveform as nearly identical to the waveform in Fig. 15 as possible.
* Adjust VR401 for minimum size of the waveform display on the spectrum analyzer.

5-2-2. Adjustment of Transmitting Frequency, Driver Output

* Connect an oscilloscope and frequency counter to TP405.
* Connect a spectrum analyzer, of 50 ohms input impedance, to J403. Use an attenuator if needed.
* Set the frequency display to 6.000.
* Push the PTT lever to put the PCS-4000 in the transmit mode. Adjust L401 for maximum size of the waveform display on the oscilloscope.
* Adjust L420 for a frequency counter reading of 16.9000 MHz, to within 100 Hz.
* Adjust L402 for maximum size of the display on the spectrum analyzer.
* Adjust VC403 and VC404 for maximum size of the display on the spectrum analyzer; this will be a critical adjustment.
* Adjust L401 and VR401 for minimum spurious output on neighboring frequencies, as shown on the spectrum analyzer. This will be a critical adjustment.
* Check to be sure that the spurious outputs are down at least 60 dB in the range 142.000-149.995 MHz, and that the output is above 200 mW.
* If the above values are not achieved, change the frequency and repeat the above steps until these requirements are met.

5-2-3. Output Adjustment

* Be sure there is a reliable connection between the driver output and the RF power-amplifier input.

* Connect a wattmeter, spectrum analyzer and counter to the output connector via an attenuator, if needed.
* Set the frequency display to 6.000 (5.000 for European model).
* Push the PTT lever to put the PCS-4000 in the transmit mode. Adjust VR403 for a wattmeter reading of 27 watts.
* Check that the output, spurious suppression, and frequency are within specifications at several points in the range 142.000 to 149.995 MHz. (For the European model, check between 144.000 and 145.987 MHz.) Since an M-coupled APC (automatic power control) is employed, a somewhat higher power output is to be expected with the US model at the lower end of its frequency range.
* Set the frequency display to 6.000 and push the H/L button to set the PCS-4000 to the low-power mode.
* Push the PTT lever, and adjust VR402 for a wattmeter reading of 5 watts.
* Adjust VR501 so that two LEDs of the RF bar-graph LED meter are illuminated in the low-power mode at 5 watts.
* Push the H/L button to return the unit to the high-power mode. Be sure that all five LEDs of the RF bar-graph LED meter light up when transmitting.

5-2-4. Modulation Adjustment

* Connect a dummy load and linear detector to the output connector using a directional coupler.
* Apply a signal of 30 mV RMS at 1.8 kHz, with 600 ohms impedance, to the microphone input terminal.
* Push the PTT switch to set the PCS-4000 to the transmit mode. Adjust VR404 so that the indication on the linear detector becomes ±5 kHz.
* Set the input at the microphone input to zero.
* Press the respective keys on the front panel, and adjust VR404 so that the linear detector indication becomes ±3 kHz.
* For the Eurpoean model, press the TONE switch and adjust for a linear detector reading of ±5 kHz.

5-3. Receiver Section (Fig. 16)

5-3-1. RF amplification Stage

* Connect a tracking generator to the antenna connector.
* Connect a spectrum analyzer to TP301.
* Disconnect the cable supplying the local oscillator signal from J301.
* Adjust L301, L302, HR301 so that the waveform display on the spectrum analyzer closely resembles that in Fig. 17,

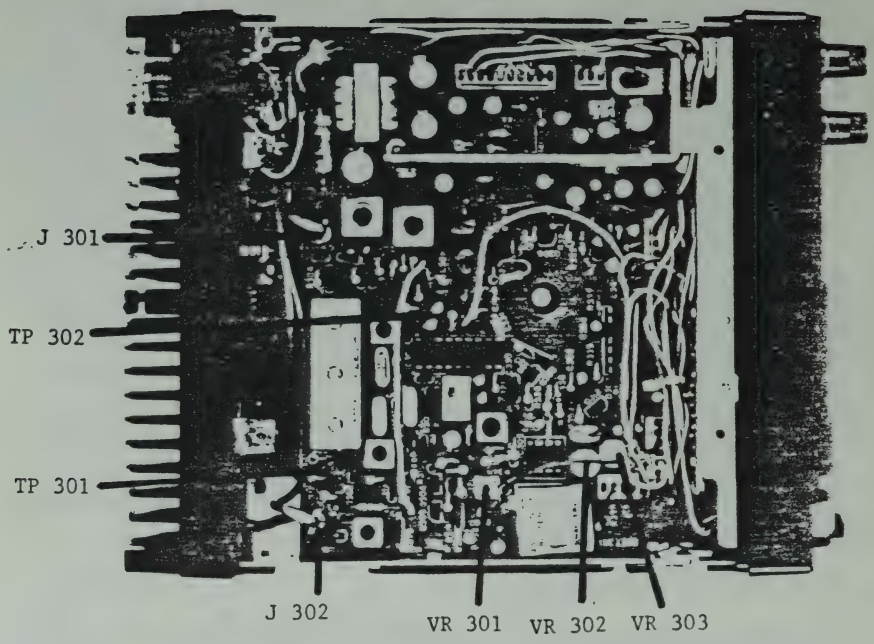


Fig. 16

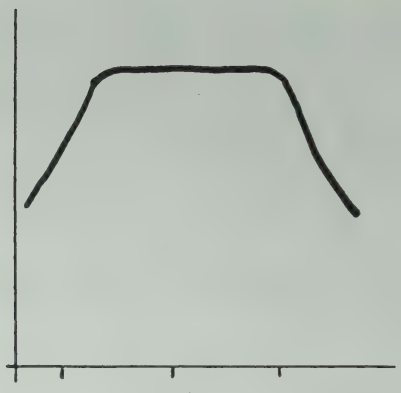


Fig. 17

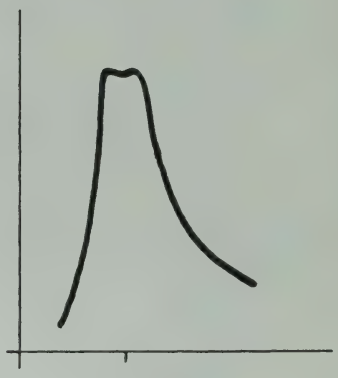


Fig. 18

and the amplitude becomes maximum.

5-3-2. IF Amplification Stage

* Connect a tracking generator to TP301.
* Connect a spectrum analyzer to TP302 via a high-impedance probe.
* Adjust L304 and L305 so that the waveform display on the spectrum analyzer becomes maximum, and closely resembles the display shown in Fig. 18.

5-3-3. Signal-strength Meter, Discriminator Adjustment

* Connect a local-oscillator signal of constant amplitude to J302.
* Connect a SSG to the antenna connector.
* Connect a dummy load of 8 ohms to the speaker jack, and connect an AC voltmeter across this dummy load. Set the volume control to the 12 o'clock position.
* Set the frequency to 6.000 (5.000 for European model).
* Set the SSG output to 146.000 MHz (145.000 for European model), 10 dBf, modulation frequency 1 kHz, and deviation ±3.5 kHz.
* Adjust VR301 so that four LEDs of the signal-strength meter are illuminated.
* Adjust L306 for maximum indication on the voltmeter.

5-3-4. Adjustment of Scan Control Circuit

* Connect a SSG to the antenna connector.
* Set the SSG output to 146.003 MHz (145.005 MHz for the European model), 20 dBf, modulation frequency 1 kHz, and frequency deviation ±3.5 kHz.
* Set the frequency of the PCS-4000 to 6.000 (5.000 for European model).
* First turn VR303 fully counterclockwise, and then turn it slowly clockwise until the BUSY LED on the front panel illuminates. Turn VR303 just a bit further clockwise after this point is reached.
* Change the SSG frequency to 145.997 MHz (144.995 MHz for European model).
* First turn VR302 fully counterclockwise. When it is then turned slowly clockwise, the BUSY LED will come on for a moment and then go out again. Turn VR302 further clockwise until the BUSY LED comes on a second time. Then turn it slightly further.
* The above procedure provides a scanning window of about ±3 kHz for the US model, and about ±5 kHz for the European model.

6. TROUBLESHOOTING

6-1. Display Malfunction

Refer to the flow chart, Fig. 19.

6-2. Insufficient Receiver Sensitivity

The second local oscillator of the PCS-4000 receiver is set to oscillate at a low level, in order to improve the suppression of spurious signals. Often, a lack of receiver sensitivity is the result of an interruption in the oscillation. Check the level of the second local oscillator first. Using a high-impedance probe at pin 2 of IC301, a voltage of 100 to 150 mV should be seen.

If this oscillator is functioning properly, localize the problem by inserting signals at various points along the receiver chain until the defective stage is found.

6-3. Hum During Reception

The dynamic signal for the display may cause hum in the receive mode if the screw near R340, on the receiver board, is loose. Tightening this screw will eliminate this problem.

6-4. Hum During Transmission

The same loose screw mentioned above may cause hum on the transmitted signal. If objectionable hum still occurs after this screw is tightened, insert a disk ceramic capacitor of 0.01 uF between the heat-dissipating fin of IC 304 (uA7805) and L302. Also, be certain that all screws holding down the circuit boards are tight.

6-5. Modulation of Transmitted Signal

With early models, serial numbers 200001 to 201000, a tone may occur on the modulated signal. To correct this, perform the modification shown in Fig. 20.

6-6. Modulation Interruption with High-level Audio Input

This condition may occur with early models, serial numbers 200001 to 201600. It may be eliminated by changing R472 from 100K to 51K. Also, solder a ceramic capacitor of 0.001 uF between pins 2 and 5 of IC402. Do not use too much capacitance or the high-range modulation characteristics may be adversely affected.

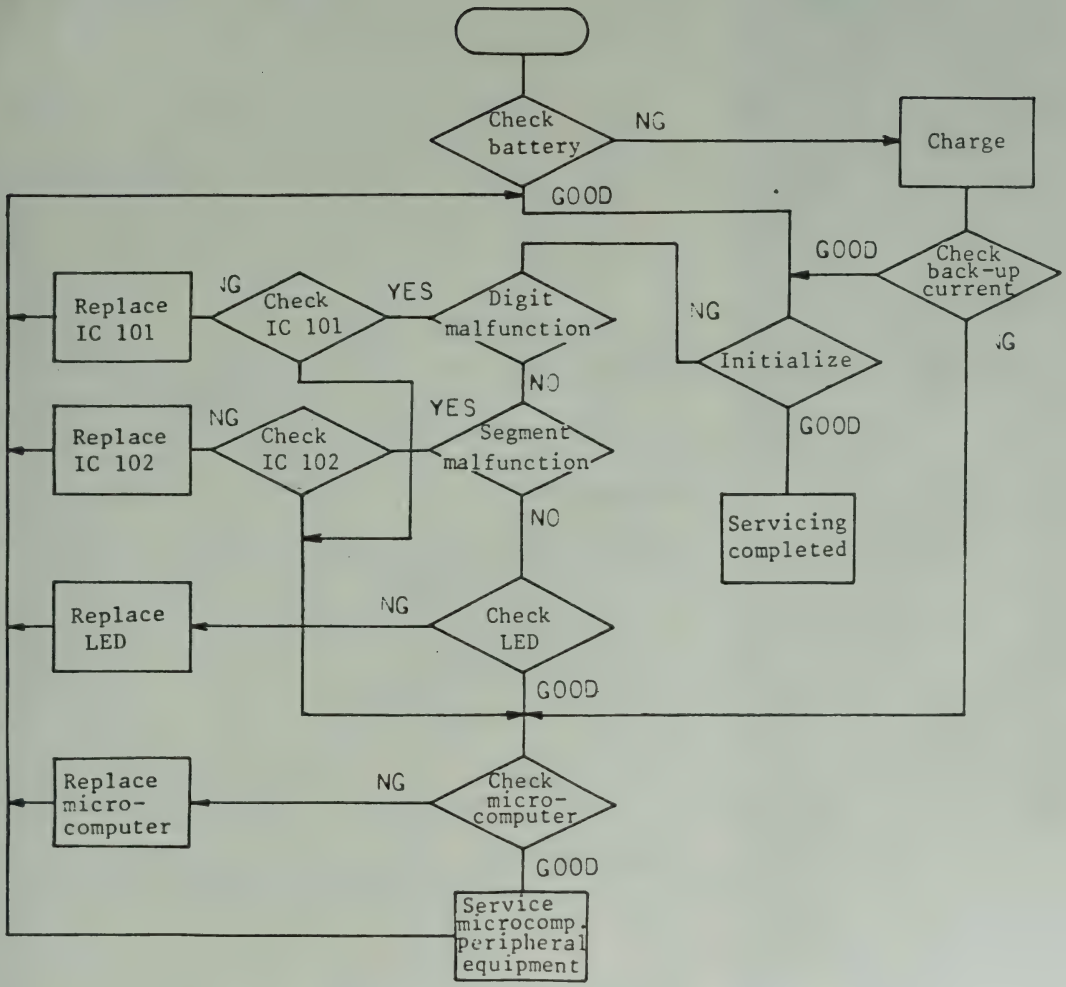

Check battery
NG
Charge
GOOD
GOOD
Check back-up current
NG
Replace IC 101
NG
Check IC 101
YES
Digit malfunction
NG
Initialize
NO
GOOD
Replace IC 102
NG
Check IC 102
YES
Segment malfunction
NO
Servicing completed
Replace LED
NG
Check LED
GOOD
Replace micro-computer
NG
Check micro-computer
GOOD
Service microcomp. peripheral equipment

Fig. 19

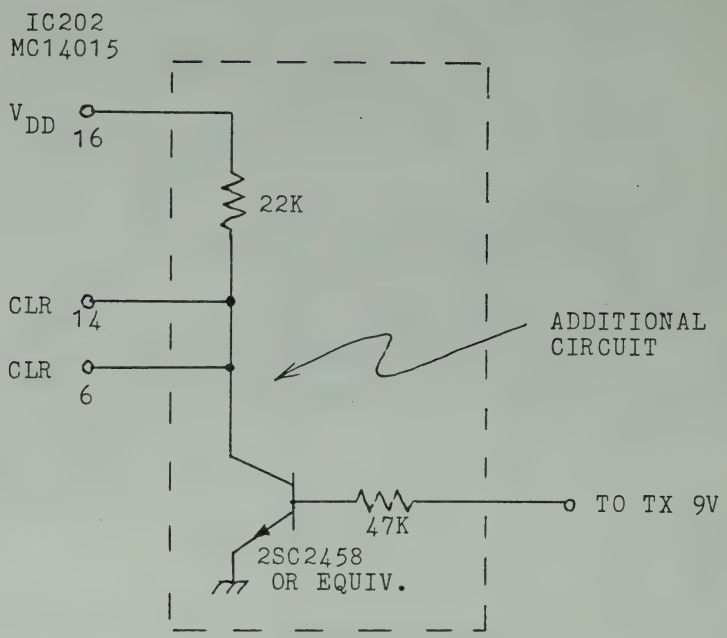

IC202
MC14015
V_{DD}
16
22K
CLR
14
CLR
6
ADDITIONAL
CIRCUIT
TO TX 9V
47K
2SC2458
OR EQUIV.

Fig. 20

QRV Electronics

503 Main St. - 106-A
P.O. Box 330
Crawford, GA 30630
Ph/Fax 706-743-3344

2-6-96

MIKE MYJAK
2545 HIGHTOWER RD
BALLGROUND, GA 30107

Your unit has been analyzed by our Service Department. The estimated repair cost is as follows:

MODEL AZDEN PCS-4000 SERIAL # 204499 AMOUNT $ 83.02

MODEL _____ SERIAL # _____ AMOUNT $ _____

MODEL _____ SERIAL # _____ AMOUNT $ _____

TOTAL $ 83.02

Payment may be made by check, money order or credit card. COD charge is $ 5.00 extra.

COMMENTS: _____

If you do not wish to have your radio repaired, please remit this amount to cover the analysis and return shipping fee: Amount $ 35.00

Thanks!

QRV Service Dept.

QRV ELECTRONICS
503 MAIN STREET - 106-A
P. O. BOX 330
CRAWFORD, GA 30630
PH/FAX (706) 743-3344

SERVICE ORDER

C9600063

☐ SERVICE ☐ INSTALL	☐ PICKUP ☐ DELIVERY	REPAIR IN ☐ HOME ☐ SHOP	DATE ORDERED 2/1/96

Name MIKE MYJAK ☐ C.O.D. ☐ CHARGE

Address 2545 HIGH TOWER RD Phone 770-887-9979

City BALL GROUND State GA Zip 30107

MAKE	MODEL	SERIAL NO.
AZDEN	PCS-4000	204499

☐ WARRANTY ☐ CONTRACT ☐ ESTIMATE

SERVICE REQUESTED: MB MAN HWR ANT DC BOX BAT MIC STYRO BC BC-1 NOTE ✓ NO ACC

DATE PROMISED / /

QUAN	PART NO.	DESCRIPTION	PRICE	AMOUNT
1		2SK192		5 00
1		2SC2669		5 00
1		5K POT		3 00
2		PANEL LAMP		4 00

WARRANTY VOID IF COVER IS REMOVED

SERVICES PERFORMED
REPAIR PLL CKT, REPLACE DEV. POT, KEYPAD LAMPS. TUNE TX/RX

TIME START
TIME FINISH
HOURS

TOTAL MATERIAL	17 00
LABOR AND SERVICE	60 00
TAX	1 02
DEL CHARGE OR MILEAGE S/H miles	5 00
CASH ON COMPLETION OF WORK ➡ TOTAL	83 02

DATE COMPLETED /

I hereby accept above performance, and charges, as being satisfactory and acknowledge that equipment has been left in good condition.

WARRANTY VOID IF COVER IS REMOVED

CUSTOMER'S SIGNATURE

TECHNICIAN'S SIGNATURE

Adams 3-584

THANK YOU
Service Order

ORV ELECTRONICS
5?3 MAIN STREET - 106-A
P. O. BOX 330
CRAWFORD, GA 30630
PH/FAX (706) 743-3244

SERVICE ORDER

MIKE MYVAK

2545 HIGH TOWER RD 770-887-9979

BALL GROUND State GA Zip 30107

PCS-4000 204409

MB MAN HWR ANT
DC BOX BAT MIC
STYRO BC BC-1

WARRANTY VOID IF COVER IS REMOVED

1	2SK??	5.00
1	2SC2??	5.00
1	SK ???	3.00
2	POWER AMP	4.00

WARRANTY VOID IF COVER IS REMOVED

THANK YOU

Service Order

[redacted] ELECTRONICS
[redacted]3 MAIN STREET - 106-A
P. O. BOX 330
CRAWFORD, GA 30630
PH/FAX (706) 743-3344

47915

DATE 2-28-96

NAME Mike Mijack

ADDRESS

ORDER NUMBER C9600063

CITY STATE ZIP

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RETD.	PAID OUT

ITEM	QUAN.	DESCRIPTION	PRICE	AMOUNT
1	1	4K (204499) parts		17 -
2		labor		60 -
3		ship		5 -
4		tax		1 02
5				
6				
7		4251-1033-0003-5094		
8		10/97		
9		028894 / 28059001		
10				
11				
12				
13				
14				

RECEIVED BY

TAX

TOTAL 83 02

FM 2-4705 REV

ELECTRONICS
MAIN STREET - 106-A
P. O. BOX 330
CRAWFORD, GA 30630
PH/FAX (706) 743-3344